

**RESIDENTIAL BUILDINGS
SUITED TO INDIA**

15

RESIDENTIAL BUILDINGS SUITED TO INDIA

Presented by
SARAT CHANDRA MUKERJEE
OLD No. 11 (New No. 1/2)
Narendranath Mukerjee Road
P.O. Bally, Dist. Howrah (W.B.)

BY
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*Author of "Sulabh-Vastu-shāstra" or
Building Construction Simplified.*

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PREFACE

The very cordial reception granted by the press, profession and public at large to my *Sulabh-Vāstushāstra*, a practical treatise on Building Construction in Marathi (which, by the way, is being translated into Gujarathi, Kanarese and Hindi), has encouraged me to venture to publish the present volume which essentially deals with the aspect of planning domestic buildings suited to Indian conditions and social customs.

The process of compiling the notes and drawing and compressing the plans herein embodied has, by no means, been a light task, particularly as the work has been done in the moments which could be spared from activities mostly in the field of brick and mortar which are hardly conducive to attempt a work of even a semi-literary character. Besides, in order to widen the field of usefulness of the book an attempt has been made to write it in a foreign language which has been a further handicap. It would, therefore, be no wonder if there were mistakes in it. Corrections from any source whatever will be gratefully received and considered.

The labour involved in preparing the plans was certainly not exhilarating and in fact there were moments when, I thought of giving up the attempt. But the encouragement, appreciation and help received from various quarters has prompted me to persevere in my undertaking and now that I have seen the work through in a book form I heave a sigh of relief. It is impossible to mention and thank in the brief space of a preface the

numerous friends who directly or indirectly rendered valuable assistance to me. I cannot, however, refrain myself from offering my hearty thanks to **Mr. R. B. Junnarkar**, Supervisor, P.W.D., Bombay and to **Mr. B. B. Kamat**, Inspector of Science Teaching, Bombay Presidency, for their great help, without which it might not have been possible to produce the book in the present form. My respectful thanks are tendered to the old and venerable gentleman, Rao Bahadur **V. N. Parulkar**, M. I. E., I. S. E. (retired) who having appreciated my industry uniformly encouraged me from the very beginning and at my request, went through the preliminary notes and a few plans and made very valuable suggestions.

I am thankful to **Mr. L. V. Sathe**, G.D., A.R.C., Architect Bombay for supplying the plans in pages 256 to 266.

I must express my thanks to **Mr. M. G. Deshpande**, proprietor, the Kohinoor Photo-Zinco, for so nicely preparing the blocks of all the plans in the book and the Manager, Aryabhushan Press for the very good printing work done.

Finally, I desire to acknowledge my indebtedness to the authors of the books mentioned in the Bibliography which follows for the great assistance their excellent works have been to me, not only in connection with this book, but also, and even to a greater extent, in solving difficult problems in construction in practical works on my hand.

Saraswat Brahmin Colony }
 POONA }
20th March 1931.

R. S. DESHPANDE.

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LIST OF BOOKS CONSULTED.

- (1) The Cheap Cottage and Small House—
Gordon Allen.
- (2) The Principles of Planning Building—
Percy L. Marks.
- (3) How to Plan a House—G. Gordon Samson.
- (4) Houses and Villas for Britishers Abroad.—
G. Gordon Samson.
- (5) Houses Planned for Comfort—G. Gordon
Samson.
- (6) Valuations and Compensations—Banister
Fletcher.
- (7) Erection of Dwelling Houses—S. H. Brooks.
- (8) Industrial Housing—Morris Knowles.
- (9) The Housing Handbook—W. Thompson.
- (10) Dangerous Structures—G. H. Balgrave.
- (11) Modern Buildings, Volumes I, II and V
—Henry Adams.
- (12) How to Estimate—J. T. Rea.
- (13) The Modern House Constructions Vols I,
II and IV—G. Lister Sutcliffe.
- (14) The Book of Bungalows—R. Randal
Phillips.
- (15) Concrete Cottages, Bungalows Garages
—Albert Lakeman.
- (16) Building Construction (Advanced Course)
—Mitchell.
- (17) Bombay Municipal Bye-laws.
- (18) Science of Building—E. Windham.
- (19) Practical Housing—J. S. Nettlefold.
- (20) Bungalows and Country Residences—R. A.
Briggs.

(21) Cheap Dwellings Actually Built—Paul N. Hasluck.

(22) Bungalow Residences—T. Harrison.

(23) The "Country Life" Book of Cottages—Lawrence Weaver.

(24) Practical Bungalows and Cottages for Town and Country—Fred T. Hodgson.

(25) Rural Hygiene—G. V. Poore.

(26) Public Health and Housing—J. E. J. Sykes.

(27) Sanitation in India—J. A. Turner and B. K. Goldsmith.

(28) Essay on the Architecture of the Hindus—Ram Raz.

(29) Essentials of Architecture—John Belcher

(30) History of Architecture—Banister Fletcher.

(31) Painting Materials—Charles L. Condit and Jacob Scheler.

(32) A Manual of Painting—Ellis A. Davidson.

(33) Leaflets 1 to 47—Cooperative Housing Association, Bombay.

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INTRODUCTORY.

To build a home is a primary instinct to be found throughout the whole animal kingdom. Rats and moles dig holes under ground. Ants build up anthills; birds build their nests—some of them with such an ingenuity as would put to blush even the 20th century architect. The mathematical accuracy and the sense of economy displayed by bees in the cells of a honey-comb are very striking.

Man himself is no exception in this manifestation of the primary building-instinct, inspite of the boast that he stands high above the level of other animals. One has only to watch his activities in childhood—the period he stands farthest from the “Civilised man” he loves to term himself. Whenever children play under a roof or on the sands, their most pleasant occupation will be found to be to “make a house” or to “play at keeping a house” with all sorts of improvised materials and make-beliefs. Recall, Dear Reader, the faint memories of your childhood and verify for yourself the truth about this building-instinct even in man.

Particularly in India is this instinct sanctified by usage. It is the peculiar trait of the Indian mind to look upon the ancestral home with an amount of sanctity. If he inherits none, he must build or acquire one. With him “No home” is “No status”. The status and the respectability of a man is

largely gauged by his possession of a house to live in. Mere wealth, however immense, does not give him that status in society which even a man of slender means can command if he owns an humble cottage. So strong is this sentiment that people of all grades and professions—merchants, lawyers, doctors,—all love to invest all their savings, even though meagre, in building or acquiring a house, even though the prospects of a return may not be so bright as in other forms of investment.

Yet, inspite of this fact that so much importance is attached to one's own home, it is a pity that very few people give it the due thought and attention which this matter of vital importance deserves. Except in a few cities in which Municipal or Executive Authorities compel the owners by law to submit the plans of proposed buildings, no one ever attempts to do so and even in the case of the plans submitted they are just sufficient to satisfy the Municipal requirements.

This apathy towards seeking systematic, scientific advice must, however, disappear. Of recent years, there has been a marked tendency of people to purchase a small plot of land on the outskirts of a city or a town and to build on it one's own cottage in preference to dwelling in dingy, stuffy, old, rented houses in the urban area. This is no doubt a hopeful sign; but what usually happens is that the overflowing enthusiasm of people prompts them to try their own hand at planning without the necessary knowledge, discrimination and experience, which the importance of the work demands. No plan is drawn, no estimate is framed and

sometimes the building work is started even without the necessary funds at the owner's disposal. The work of construction is entirely left to the mercy of the quasi-literate maistry or illiterate carpenter or to a class of contractors hardly equipped with any systematic training in their art. Most of the latter usually belong to the same category of people as maistries and masons, but have risen to a slightly higher level due to some turn of good fortune. Most of them, however, are generally equally incapable, more or less, to properly grasp the ideas of a decent living, and to provide for the arrangements and comforts which a cultured man with a delicate and refined sense of decency, demands. To make confusion worse confounded, laymen friends pay kind visits and dole out suggestions while the building work is in progress, though with the best of intentions, yet equipped with sheer ignorance: "Nine feet floor height makes the building look ugly; it should be at least 11 feet. Mr. So and So's bungalow looks like a palace with that height. Such things are done once in a life time. Don't spoil your bungalow for the sake of a few rupees" and so on. These "few rupees" in so many items go to swell the cost by 50 p. c. which the owner cannot realise. But when the time for payment comes in, his eyes are opened, his enthusiasm gets a rude shock and often times the property falls into the hands of the creditor. Apart from the inflated cost which is the natural result of such houses built under these circumstances, the house, or rather a "masonry box" with a tiled lid affording protection from the sun and wind—(not to say, "from rain" because the roofs of

such houses are often hospitable enough to welcome rain inside)—fetches very little value in the market when offered for sale.

There is only one way to avoid such a catastrophe; viz., to get a suitable plan drawn and a complete estimate framed with the help of some architect who knows his job well. It is a "penny wise and pound foolish" policy to grudge spending a trifling amount for this very important matter. The preliminary design may be made by the owner to indicate his special requirements to the architect, but beyond that it is advisable to leave the details to his experienced and mature judgment. Still, on the other hand, howsoever clever and expert an architect may be, it is impossible for him to gauge correctly the peculiar requirements, the likes and dislikes, the prejudices and idiosyncrasies of his client. I have come across some doctors and professors who have eminently distinguished themselves in their own lines but have exhibited gross ignorance of even the correct idea of dimensions. An average person, if he but takes a keen interest and approaches the subject in a spirit of determination to study and choose the best, can easily master the art of house planning in a short time. He should first begin with measuring with a tape the dimensions of the rooms he is occupying, the doors, windows and all other details, so that he can at once determine what bigger or smaller sizes would exactly suit him. The next lesson is to actually visit a few typical houses of his friends and note the conveniences or otherwise experienced by them for his guidance.

A practical hint, in this connection, would, I hope, be not out of place here. If the house which is going to be built is calculated to give happiness to the family, one must take the counsel of the partner of his life's happiness in respect of its planning. We give the lady of the house the high sounding title such as 'Grihini' or "Grihlakshmi" i. e. "mistress of the house," "The presiding deity of the house" and still do not consult her even in respect of the kitchen arrangements with which she alone is concerned. It is a mistake to suppose that a woman cannot understand these things. On the contrary the term "Better half" given to her proves itself to be literally true in this respect. Ladies are very sensitive to appreciate the conveniences and especially to feel the inconveniences of a living house. That is, par excellence, *their* sphere of life. Measured in hours they live in the house more than we do. You will be surprised to find what an amount of common sense your wife will show in criticising the plan of a house and making suggestions in respect of conveniences, delicacies and refinements of arrangements which we, of sterner sex, could scarcely think of.

Very direful is the result of this obvious omission. Its bitter experience comes to the lot of the unfortunate house-owner. Soon after the eventful day which he had so eagerly been longing to see, viz: the day on which the palatial building of his proud ownership is first occupied, he is constantly heckled by sarcastic criticism by day and dread curtain lectures by night, such as, e. g., "The bathroom is too small;" "the staircase should have been

in that place;" "the sink would have been better in that corner;" "the smoke outlet does not work;" "there is absolutely no seclusion for worship or offering prayers in the whole house;" and so on. His eyes are now opened, his pride of possession melts away, his enthusiasm is crushed, the fool's paradise crumbles to the ground and he finds his life not worth living and though the inner sense of his vanity would not allow him to own defeat and frankly apologize, he repents for his folly in not having allowed his "better-half" a part in the counsel which would have at least saved him from such searching criticism.

What does exactly connote good planning? When is a house said to be well designed? The answer is not far to seek. A house designed economically, which preserves the health of the inmates and adds to the comfort and happiness of the family may be said to be well designed. A good house must exactly suit the family, just as clothes do the wearer. The external embellishment, the overflowing, elaborate architectural features contribute very little to make a house comfortable. The value of a house designed for comfort will certainly be enhanced if it synchronises with external beauty. But a house with the best exterior may be found to be a failure as an investment when compared with a cosy, plain-looking cottage solely designed for convenience and comfort.

When we see all around us, we find that there is a general tendency, which is increasing every day, of people to leave healthy villages and flock to industrial centres in crowded cities. This exodus

has been caused by a good many deep-rooted causes, mostly economic, such as poverty, depression of agriculture, lack of educational, banking, marketing and medical facilities, habits of uneconomical living, attractions of city pleasures and enjoyments, and so on. This has resulted in creating a dearth of houses both in towns and villages—in towns because there is a house-famine and in villages because the houses which are deserted crumble to ground for want of care. The evil consequences of the house-famine which has affected every grade of society living in towns are the inflation of rent and overcrowding of rooms, of which the latter brings in its train, high death-rate, especially amongst infants, mental restlessness, physical weakness, lung diseases, and the lowering of general vitality etc.

The abnormal rise in the cost of foodstuffs and clothing on account of the outbreak of the Great War, added fuel to the fire and made the position of the middle and lower classes still worse, in spite of the Rent Act, which came to their assistance for some time at Bombay and some other places, to give them some relief. They could not but submit to the unreasonable demands of their landlords. But after some time when prices of foodstuff and clothing showed some improvement, they were prepared to take every opportunity of throwing off the yoke and be independent of their landlords by trying to build small cottages on the outskirts of towns. The Co-operative Societies' movement, inaugurated by Government, promoted their efforts by offering

them loans at low interest if they formed themselves in to a registered Society. The efforts of the Development Department, Bombay, further stimulated them by offering concrete examples of cheap dwellings and it is now a hopeful sign of the time that people have realised that, instead of paying abnormal rents and living in the midst of unnatural conditions, they could, with a loan raised from Government, build, in the midst of healthy surroundings, cottages according to their own choice which will ultimately become their own, if they paid, monthly instalments for a fixed period, instead of monthly rents. It is very satisfactory that a number of Cooperative Housing Societies are fast springing up.

While endeavouring to promote one such Society, viz., the Saraswat Brahmin Colony, in Poona, of which I have the privilege of being one of the prime organisers, I got a unique opportunity to study the problem at first hand and realise the difficulties which confront the laymen, who for want of facilities have to design their own houses and entrust the construction to the semi-literate maistry. I very much deplored this state of affairs and resolved to try to relieve the situation partially by (1) writing practical notes, preferably in vernacular, on building construction in a manner easily intelligible to the lay mind and (2) publishing a few typical plans of cottages suitable for Indian climate and social customs. The former took the shape of a book in Marathi which has been very enthusiastically received by the public and I am glad to state that, it is being translated into other

important vernaculars of India. The present volume is the result of my attempt to carry out the latter part of my determination.

In this volume I have sought to deal mainly with plans to illustrate the disposition of rooms, offices etc. in domestic buildings. I have in no sense made an attempt to deal with the details of construction or of architecture,—these subjects open up a very vast field and the reader is requested, particularly in respect of the former, to refer to my practical treatise on building construction. It is being translated into English also in which construction is dealt with in detail. Here, I have sought to cater mainly for the middle and lower classes. The few plans of large and rather costly houses might, however, interest the richer class. Again, there is a class of builders who look upon building as an investment from the point of view of business. To them I should like to offer the advice, to build houses not on a commodious plan but compact ones suitable for the middle classes which are sure to be always in demand. The designs of flats and chawls given in this volume will be very much appreciated by them.

It is to be noted that the plans herein given are intended to be merely suggestive and to supply ideas. They are never meant to be blindly adopted in toto as they stand. This remark is still more applicable to the elevations given which are merely expository and admit of any desired alterations.

I have drawn these plans and written the notes in my spare moments, little bits of time, which I could spare after fulfilling my official and other

duties, in consequence of which, naturally years have passed by, fresh experience being added to my ideas and improving upon them. I do not claim that the experience so gained has attained maturity or perfection, but conscious as I am, of the many defects and imperfections I have ventured to embody the same into a concrete book form with a sincere desire to be of some use to laymen who are greatly handicapped in a technical subject like building on modern lines. If the book proves to be of some use in this direction I shall feel myself amply rewarded.

Before I conclude, a word by way of explanation of the figures of costs quoted in the book would not be out of place. For working out these costs a few typical estimates of each class of buildings were framed with the rates of material and labour at present (1930 Sept.) current in Poona and the results were compared with the costs of a few buildings actually constructed. The rate per sq. ft. of plinth area, thus arrived at, has been taken as a basis for working out costs, to which some constant figures are added to meet the extra cost for special features such as bay-windows, turrets, nooks, projections, etc.—They do not include costs of site, fencing, drains, electric fittings etc. It is hoped that they will serve as a rough guide to people who have so far been groping in the dark.

Suman-vikas,
Saraswat Brahmin Colony }
POONA 2,
15th December 1930.

R. S. DESHPANDE.

Rough Cost.

When the layman has decided upon the length and breadth of the house to suit his requirements as set forth in the foregoing Introduction, the next question which confronts him is approximately to estimate its cost and see how it suits his purse. Very often the Maistry, whose help he seeks, has either got no clear idea about it or in his attempt to please his constituent, intentionally quotes a low figure. And, when the actual construction ultimately costs him double the amount, he blames the maistry, but the latter escapes all responsibility saying that the additions and alterations subsequently made by him (the owner) are responsible for the increased cost and that therefore no blame attaches itself to him. Though this may be partially true it is not wholly so. The owner now realises how he was be-fooled. In order, therefore, to save oneself from such a calamity it is, absolutely necessary that there should be some rough and ready rule to find out at once what a particular sized house is going to cost or what size of a house one can build within a certain amount, which one can afford to spend. The following rule will serve that purpose very well:—

Multiply together the length and breadth of the plinth (both in ft.) and find out the plinth area of the house. Multiply this by one of the rates given below according to the character of the structure specified opposite to them.

Note:—The rate per square foot of plinth area mainly depends, amongst many factors, upon the cost of labour and materials and may slightly vary according to the locality and also market fluctuations. Those, given below, have been worked out for conditions obtaining in Poona at present. In big cities cement and hardware materials and skilled labour are cheap but un-skilled labour is costlier than in the rural districts. For an ordinary building the cost on account of labour is roughly 35 per cent and that on account of materials 65 per cent approximately. Out of the 35 per cent required for labour, 49 per cent go to the un-skilled and 51 per cent to the skilled labourers. However, the figures of approximate cost arrived at, are sufficiently accurate for the purpose.

- (1) Stone or burnt brick in lime masonry, including cement pointing on the outside and lime plaster on the inside; flooring of Shahabad stones on 3 inches lime concrete in all rooms; half-panelled and half-glazed or fully glazed doors and windows; Mangalore tiled roofing on teakwood ceiling; height of floors 10 to 12 ft., that of plinth 3 ft; all other work not very ornamental but strong and decent... Rs. 5.

- (2) Stone or burnt brick in lime masonry, including cement pointing on the outside and lime plaster on the inside; Shahabad paving on three inch lime concrete in all rooms; Mangalore tiled roof on corrugated iron sheets; half-glazed and

half-panelled doors and windows only in the drawing room and plane-planked, in the remaining; height of floor 9 ft. and that of the plinth 2 ft; all other work strong, but 2nd class in quality...

Rs. 4-8.

- (3) Framed structure of round teak ballies (posts of rafters) with stone or burnt brick in mud masonry for walling; lime pointing on the outside, mud plaster inside; Shahabad or Katni slab paving in important rooms only, and murum flooring in the rest; country round, Mangalore or Allahabad tiled roof on battens; doors and windows all plane planked; height of floors 8 ft and that of plinth $1\frac{1}{2}$ to 2 ft. Rs. 3-12.

The above constants are applicable to single storey structures only. For two-storied buildings 0.25 Rs. or four annas should be deducted from them. e. g. suppose Rs. 10,000 are available for building purposes. One can build a house with a plinth area of 2,000 square feet of class 1; 2,225 sq. ft. of class 2; and of 2,670 sq. ft. of class 3.

Putting it the other way, suppose a building is to be constructed on a plinth area of 2,000 sq. ft.

- (1) With ground floor only, it would cost :
 (1st class) 2,000 sq. ft. \times Rs. 5 (constant) = Rs. 10,000.
 (2nd class) 2,000 sq. ft. \times Rs. 4-8 (constant) = Rs. 9,000.
 (3rd class) 2,000 sq. ft. \times Rs. 3-12 (constant) = Rs. 7,500.

(2) With two storeys (the ground floor and the first floor):

(1st class) $2,000 \times 5 + 2,000 \times 4-12 = \text{Rs. } 19,000$

(2nd class) $2,000 \times 4-8 + 2,000 \times 4-4 = \text{Rs. } 17,500$

(3rd class) $2,000 \times 3-12 + 2,000 \times 3-8 = \text{Rs. } 14,500$

Some times the rough cost is determined on the cubic contents of the building. For this purpose verandahs are supposed to be like rooms and the solid contents of the house are found out by multiplying the plinth area by the vertical height of the building from the ground level to half way up the roof.

This method of finding out rough cost is more accurate than that based on a rate per square ft. of plinth area, especially if the heights are measured from the bottom of foundations, as it takes into account the depth of foundations, the heights of plinth and floors, and the pitch of the roof. But it requires more time for making calculations.

In the case of terraced or flat-roofed houses, the height should be measured up-to the top of the parapet walls.

The rates thus arrived at are:—

			Rs.	as.	ps.
Class one	...	...	0	5	0
Class two	...	...	0	4	9
Class three	...	...	0	4	8

Note:—It is worth noting that the bigger the sizes of rooms of a house, the lower is the incidence of cost and inversely, the smaller the rooms the greater is the cost per sq. ft. For, if a house, say

a chawl for instance, has got small rooms, the number of walls is greater, and with it, that of windows and doors is also more. The latter, in particular, go to increase the cost. Again, a reduction in areas of certain rooms does not always mean a proportionate reduction in the cost, because the number of doors and windows is not reduced; it remains the same. Hence to reduce the cost, a whole room or rooms must be omitted.

Economy.

Whether rich or poor, a man always likes to see his house built with economy. In fact, it is the social duty incumbent on everyone who wants to build a house, to practise economy wherever it is possible to do so. On the contrary, it is economically criminal not to do so. However, it should never be carried to excess so as to weaken the structure. A strong and solidly-built structure proves to be cheaper in the long run. Only the rich can afford to pay the heavy maintenance charges of cheap and jerry-built structures, which is not possible for ordinary people. Economy must really begin even from very trifling things. A trifling, saved in thousand items, goes to make up a big amount. Below are given a few hints on how to practise economy :—

(1) The more the dimensions of length and breadth of a house approach each other, the less is its cost. In other words an approximately square building is cheaper than an oblong one. To illustrate this, take the simple case of two houses, one measuring 80 ft. \times 20 ft. and the other 40 ft. \times 40 ft. Supposing the walls of both are of the same thickness (say 18 inches) as also the height of both is also the same viz, 20 ft, and taking only the outer walls, to simplify matters, the masonry of the first house is roughly :—

$$\text{Long walls } 2 \times 80 \times 1.5 \times 20 = 4,800$$

$$\text{Short do } 2 \times 20 \times 1.5 \times 20 = 1,200$$

and that of the 2nd, 6,000 cft.

$$4 \times 40 \times 1.5 \times 20 = 4,800 \text{ cft.}$$

Thus the masonry of outer walls only of the first house is 25 p. c. more than that of the 2nd.

Moreover, there are certain special advantages in a square house, over an oblong one, e. g., a square house is cooler in summer and warmer in winter than an oblong one, because the latter exposes greater surface to the elements. The roof of the square house looks better and is simple and less costly to construct. 3rdly, a square house being more compact, the space occupied by corridors which are necessary for the preservation of the privacy of each room is much less in a square house than in an oblong one, and so on. All this, is true up to a certain limit, beyond which, however, either open central chowks (yards) or small verandahs have to be provided for lighting the inner rooms, in which considerable space is lost; again, beyond a certain limit the height of the roof of a square house near the centre, and also the length of the hip rafters and in consequence, their section and cost, increase beyond economical limits.

(2) A storied building, having half the number of rooms on the ground and half on the first floor, is much cheaper than a bungalow or a ground-floor structure only, because the expense on account of foundations and roof for the storied building is nearly half that for the ground-floor structure. Similarly the expense for both on account of drainage channels on the ground and gutters below the eaves of the roof is the same. No doubt the staircase requires some extra amount and scaffolding and hauling up materials for construc-

tion to an increased height is more expensive; but the saving caused in foundations and roof is much more than this extra expense.

Again for a certain amount of accommodation, a ground floor structure requires a larger plot of land than a storied building. Where the site is very costly this consideration alone out-weighs all others. Besides, it is no small gain, particularly in crowded localities, that the rooms on the upper floor get a freer and purer breeze, which is a blessing in summer in a hot country like India.

This principle, however, could be stretched up to a small attic room or a low 2nd floor added on the top of the first, beyond which, the cost again increases, because the foundations and walls of a three or more storied building require to be of extra strength and hence they are more costly.

(3) For the middle-class people, there is no better way of effecting a considerable economy, than by restricting the height of floors. Ordinarily 8ft. or 8½ft. height is sufficient. It is in some houses kept 12 or even 14ft., which is not at all necessary. It is likely to be argued that more height means more cubic contents of air, which is no doubt true, but hygienically it is not the greater cubic contents of a room but the means provided for renewing the air by providing through ventilation in it, which is of more importance, for this, cross ventilation i. e. windows, in one wall for admitting fresh air and similar ones in the opposite wall for driving out the vitiated air, are required.

Another argument likely to be advanced in favour of larger heights of floors is that the build-

ing looks bold and prominent, but it should be remembered at the same time that the higher a building, the greater is the weight which its foundations have to bear and the more have its walls to resist the thrust of high winds. The artistic beauty of a building, in fact, does not depend upon its height alone but on the treatment of the proportions of its exterior parts towards each other.

By reducing the height of floor from 10ft. to 8ft. the saving effected in masonry is 25 per cent.

(4) It is not, however, advisable to try to effect economy by curtailing the height of the plinth. A high plinth contributes to preserve sanitation and health of the family and, hence, as far as possible it should not be reduced to less than 2ft. However 4 or 5ft. height of plinth, which is often times kept (unless it be in a damp locality) is a sheer waste which the middle or lower class people cannot afford.

Another means of reducing the cost of a building is to build the outer walls thick enough to protect the house from the heat of the sun and raids of thieves and to build all the inner ones of half or one brick thickness ($4\frac{1}{2}$ inches or 9 inches) with intermediate posts of wood or steel to support the weight of the upper floor or floors and roof. It is observed in a good many houses that 15" brick walls or many times 18" stone walls are built, where half or one brick partition walls could have very well answered the purpose. The main object of a partition wall is to afford privacy;

any extra thickness beyond that required for that purpose is, therefore, a waste.

(5) Local usage should be adopted, as far as possible. Maximum advantage should be taken of the material and labour locally available. e. g. if stone walls are insisted upon where stone is scarce and hence bricks are locally used, or if Moulmein teak is insisted upon where good country timber is plentiful and cheap, the work is bound to be costly.

(6) Division of labour and specialization are great points in saving money, particularly when the work is being done departmentally. Masons who are used to dressing should be employed on dressing only, and those to setting, on setting only. An artisan of high wages should not be required to do the work of an un-skilled coolie. This is a very important point which is generally overlooked, e. g. if a mason getting Rs. 2 a day is employed on the work of pointing masonry joints, perhaps he may do even less work than young boys who usually do that work on a daily wage of annas 10 to 12 and who have specialised themselves in it. Another point to be borne in mind is, never to allow a highly-paid artisan to be handicapped for want of adequate assistance; e. g., for want of an additional woman-coolie getting 5 to 6 annas per day if a mason employed on Rs. 2 per day is required to do her work partly, viz: mixing mortar, carrying bricks, stones etc., two rupees, are sacrificed to save six annas. Similarly, a bullock cart is often engaged on Rs. 2 per day for carrying certain material; the cart-man

has to load and unload it, single handed. During the interval he is doing it the high waged cart has to stand still; and it is no wonder if the outturn is far less in comparison to the amount spent.

(7) A good deal depends upon the season in which the building work is commenced. In winter the days are short and it is not possible to start the work earlier than 8 A. M. Besides, the progress of work in the first hour or so is not satisfactory on account of cold. Again the work has to be closed by 5 P. M. as the labourers have perhaps to wend their way home before dark, thus with a respite of two hours in the noon the actual working period amounts to 7 hours where-as if the building work is commenced by about the close of winter from 7 A. M. to 7 P. M., the working period, with the same meal-time respite is 10 hours; thus a saving of 23 p. c. in the cost of labour or nearly more than 9 p. c. of the whole work is effected.

(8) If work is done expeditiously (of course, without un-due haste), it is done at a much less cost than if it is allowed to linger on. The overhead charges of establishment are less and the interest on the capital outlay during construction is less. Anticipate all likely difficulties and try to solve them early in good time. For this, it is desirable to chalk out a programme not only of the whole season, but also a detailed one, of every 2/3 days in advance and try to stick to it.

(9) If doors and windows are kept of one uniform width, the joiners who have to work on uniform sizes, find it much easier and finish it more

speedily. Again fewer centerings are required for supporting lintels or arches over them.

(10) It is usual to rake out joints of masonry and fill them again with lime or cement. By so doing not only is there a waste caused, of materials and labour but the structure is weakened, because it is not possible to make a good joint of fresh cement or lime, with the mortar which has already set; again the joints filled afterwards are likely to be neglected in respect of watering. The proper method is to rake out the joints when just fresh and fill them up with lime or cement; in this arrangement the mortar raked out is not wasted and the joints automatically get the water which is sprinkled on the masonry. A still better and the most economical way is, not to rake out the joints at all, but to finish them neatly in the first instance and rub them hard with a mason's trowel the next day, saving double labour and material thereby.

(11) Settle, once for all, the plan of the building, stick to it and never make any changes or alterations except under the advice of experts who will consider the effects of such alterations on the work already done, the extra cost involved etc. and guide you accordingly.

(12) Plain and simple architecture, not only looks well but is also very economical. Bay windows, ingle-nooks, too many corners in the walls, and too many breaks in the roof are bound to increase the cost.

(13) If it is intended to add another floor in course of time, it is advisable in the interest of economy to construct in the first instance, a flat or

terraced roof at an additional cost of about 12 p. c. of expenditure on the item of roofing. In that event the top of the terrace would ultimately form the floor of the upper storey and the parapets when raised would become walls. Nothing would thus be wasted, whereas, if a tiled roof is required to be dismantled for the same purpose, not even 40 p. c. of the material is found to be serviceable, all labour being wasted, besides.

(14) If the sinks, bath rooms and w. c.s are so placed that all the sanitary fittings come near each other, a considerable amount is saved.

(15) A considerable saving may be made by buying materials at the proper time and in the best market and by maintaining a continuous supply of them at the job.

(16) On small jobs, in particular, work could be done more cheaply by using what are called 'stock sizes'. For instance up to a span of 11 ft. or at the most 12 ft., steel joists of $4\frac{3}{4}" \times 1\frac{3}{4}"$ @. 6.5 lbs. per foot run, are very cheap. If the span is increased even by 6 inches the next suitable size of joists is $7" \times 4"$ @. 16 lbs. per foot run, which costs considerably more, even though its spacing is increased.

Presented by
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SARAT CHANDRA
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Selection of Site.

Two different view points, which are in principle antagonistic to each other, govern the consideration of this very important matter. The one is of a class of builders, who may be rightly called speculating builders. They do not want to build for their own use but for that of others, and therefore do not so much care for the internal arrangements and conveniences of houses as for the immediate maximum return on the capital outlay. Their tendency is to select a locality, which though unimportant and not much in demand at present, is likely to rise soon into importance. The sites at such places are very cheap in the beginning but when they develop they fetch amounts several times their purchase value.

For the benefit of these people it may here be suggested that such localities may take years to develop or in some cases may not develop at all. It all depends upon several factors not controlled or controllable by any one man or some times a group of men. It requires an uncommon shrewdness and keen foresight, which very few people possess, to judge those factors correctly. It is therefore advisable, because involving no risk from the investment point of view, to choose a street which has already developed. There, we know the situation in its reality. The class and sort of people inhabiting that part, the rental value of buildings obtaining at that place, whether the latter is increasing or decreasing, and so on. Thus though

the return may not be so great, it is a sure source of income. Again, from the point of view of investment, if the building is not required for one's own residence, it is prudent not to build on a commodious scale. If instead of building one spacious house suitable for one rich family, several small independent flats or cottages suitable for middle or poor class families are built, there are very few chances of losses resulting from empties.

The other view-point of looking for selection of a site is, for one's own residence or for that for a collective one—either industrial or cooperative housing. The considerations for the latter are slightly different which have been treated in the chapter on Cooperative Housing Schemes. Those which are common to both are given here. They are in respect of (1) physical features (2) soil conditions (3) sanitary requirements and (4) practical conveniences.

(1) The site should be on an elevated ground which is advantageous in two ways (a) the out-look is wider and brighter and (b) it affords facility of drainage. Particularly rain water flows away from the building as soon as it falls on the ground and the immediate surrounding area is left dry. A low lying site, on the other hand, is likely to be damp and unhealthy especially in the rainy season. A slightly rolling land is better than a monotonously level ground as it permits of less expensive drainage.

Rocky surface affords good foundations and also does not absorb any water but it gets hot by day and does not readily cool down by night

especially in summer. Again, if any excavation or levelling of site is necessary it presents difficulties. Laying of drains or excavation of gutters cannot be done satisfactorily except at prohibitive expense. Besides, it is not suitable for a garden or for growing trees.

Murum at surface with hard murum or rock within 3 or 4 ft. is the best soil; next best are gravel and sand. They easily drain off rain-water. But the possible rise of subsoil water level in them is an undesirable feature, unless the site is lying high. Besides, there is a danger of their absorbing impurities from defective drains, cess-pools etc. contaminating underground supply of water. Moreover sandy and gravelly soils tend to make the house hot. In this latter respect clay is better and if firm, gives a good foundation; but if it is black cotton soil, it is the worst in this respect, requiring special expensive treatment of foundations and subsoil drainage.

Trees grown in the neighbourhood, if thick, tend to keep the temperature equable and lend a charm to the landscape.

In the neighbourhood of the sea, the difference in the extremes of temperature is very small and there is a pleasant breeze blowing towards the land by day and away from it by night as the land gets hotter by day and cools sooner by night, than water. The sea breeze is very exhilarating as it contains ozone. But the air near the sea is always humid which induces perspiration causing discomfort, languidness and enervation as it is often very sultry and oppressive. There is another

disadvantage of sites in the neighbourhood of the sea, viz, the breeze which carries with it very thin spray of salty water acts upon iron and causes it to rust. Trees and gardens also do not flourish in the neighbourhood of the sea for the same reason.

From the sanitary point of view there should be no nallas, stagnant pools of water, old quarries, nor tanks and wells in a dilapidated condition in the neighbourhood of sites. If the wells are in a good condition with a copious supply of pure water, their existence adds to the value of the site.

The site should not be one on a reclaimed ground i. e. ground which was once a depression filled up afterwards with some animal and vegetable refuse. In the first place such a ground absorbs water, becomes waterlogged, and very often the stuff putrefies giving out foul gases, most detrimental to human health. 2ndly, there is always a risk of an uneven settlement of the foundation and all the dangers to the building consequent upon it,—a state which can be remedied only at a prohibitive cost.

A busy street which, though from a business point of view, may be desirable, is quite unsuitable for residential purposes, since the nuisance of dust caused by heavy vehicular traffic is positively harmful and the constant noise created thereby, deprives one of rest, especially during sickness.

Pens of cattle, cesspits, lime or charcoal kilns, tanneries, ginning factories etc. giving out smoke, foul odours and objectionable noises should be avoided even in a distant neighbourhood. Lofty

buildings and tall trees obstruct the breeze. The latter should be under one's control, so that they could be pruned or lopped off at any moment without trespassing on the rights of anybody else.

A good and sufficient supply of drinking water should be close at hand. In rural districts, it is an ideal condition to have one's own well. If it be a public one, its water must be beyond any chance of being polluted even at any future date.

From a practical point of view, the proximity is obviously beneficial, of a railway station (not very close as otherwise sleep is disturbed—a very important point in sickness), a public but not a very busy street, a Post Office, a Hospital, a Bank, a School and the Market. Of these it is absolutely necessary for the middle and lower classes to have the school not very far off.

It is necessary in the interest of permanent happiness of the family to have a good neighbourhood.

A free-hold site is infinitely superior to a leasehold one. Before finally settling the bargain, the legal aspect of the question should be scrutinised with the help of a lawyer.

It is advisable to make provision for an additional space of land, so that, it should be easy to add a wing afterwards to prevent congestion.

Orientation

Proper orientation means that setting or facing of the plan of a building, which allows the inmates of the house to enjoy to the utmost, whatever is good and to avoid whatever is bad, in respect of comfort in the elements of nature, such as, the Sun, wind and rain. Attention to this important factor, particularly in the tropical countries, is of great moment. The word "orientation" has been used here in a broad sense. It implies not only the direction of the main front of the house, but also the back and two side facings also.

According to the Hindu orthodox principles a building should not, as a rule, face the South. But the wise men of old have provided an exception to this rule viz. that there is no objection to this, provided there is a house or a row of houses on the opposite side facing the North. In most of the western countries of Europe an aspect, which gives the maximum sunshine, is preferred. In those latitudes, the sun never goes over head i. e. is always to the south of the zenith. Besides, the climate of those places being very cold, the warmth of the sun is most enjoyable. Hence they provide for a southern aspect which gives them the maximum sunshine throughout the year. Here, in India and other tropical countries, what is sought for, is just the opposite. We want to devise means to reduce the sun's heat to a minimum especially in summer, when its rays strike us vertically or nearly so.

The Sun's action in causing heat is mostly direct by day. But by night it is entirely indirect.

Stones, bricks and tiles etc., of which the walls and roof of a house are composed, absorb sun's heat by day which they slowly radiate by night. While doing so the air in contact with them is heated which is the real cause of discomfort by night. Hence proper orientation must protect the house from both i. e. sun's direct heat by day and the indirect one by night.

Let us first consider the direct heat by day. The temperature of a place, though no doubt modified by several local influences such as, proximity of a sea-coast, hills, valleys and sandy deserts etc, or also by the elevation above sea-level, soil, vegetation and woods etc, is mainly governed by the latitude of the place or, which amounts to the same thing, the altitude of the sun above the horizon of the place. The mean daily altitude of the sun is highest in the tropics or the torrid zone and decreases as one goes either northward or southward towards the arctic or the antarctic zone. The total heat absorbed depends, again, on two factors (1) The intensity and (2) the duration. The aim of proper orientation, must be, to admit the required amount of sunshine into the house in the morning when it is very pleasant, and the intensity of its heat is less, and to minimise its duration in the afternoon and evening when its rays are again likely to enter the house. In the noon time the sun is generally overhead in the tropics and therefore its rays are not likely to enter the house.

The Sun's rays are potent to kill germs of diseases, but for that purpose severe heat is not necessarily required. The morning sun not only

does it satisfactorily, but lends cheerfulness in addition, coming as it does, after the chill and darkness of the night. The reason of it is, that there is full light, but very little heat in the morning sunshine. The cause of the less heat is three-fold: (1) The morning sun is inclined at a low angle with the horizon; its slanting rays, being spread over a greater area, bring to each square unit of surface less heat and thus diminish its effect. (2) Also, the oblique rays have to pass through a greater thickness of atmosphere which has already cooled down by the night, and again, (3) the air in the morning is charged with water vapour which allows the light rays to pass freely, but absorbs the heat rays in their passage. As the sun rises, its rays fall more and more vertically and heat becomes more and more concentrated. The moisture in the air also slowly disappears and the heat rays are less and less absorbed. In the afternoon and evening, even though the rays are again slanting, the air being dry, heat rays which are no longer absorbed, are intensely felt. That is why the evening sun is not so pleasant and charming like the same in the morning, and therefore is abhorred to a certain extent.

Thus we see that a certain amount of sunshine inside the house is not only desirable but is welcome. However, when we have just enough of it and it grows severe in heat, it should be shut off. Mere closing down windows for this purpose is not sufficient, because in that case, it will still heat the walls, and their radiation will make the rooms on that side quite uncomfortable. Hence we must so set or face the building that the sun's rays will be

effectually excluded without closing windows in the late hours of the morning, especially in summer.

By facing of the building is meant placing of such rooms on that side which are mostly occupied during the daytime.

If a certain amount of sunshine is allowed to penetrate into the house during early morning hours, it is bound to do so also a few hours in the late evening; to effectually exclude this and render it harmless, deep verandahs on the south and west side, have to be provided.

We have discussed above how it is possible to regulate the sunshine, but it is not the only factor contributing towards comfort. Air in motion or what is called breeze, and aqueous vapour or the relative humidity in the air are equally or perhaps more important than heat. It is the general experience that in spite of a low and equable temperature of sea-coast places, a still atmosphere which does not materially help evaporation, causes greater discomfort at those places, than a comparatively high temperature, in dry, arid plains, accompanied by a breeze. A high humidity causes perspiration and if the atmosphere be calm and still, which does not cause evaporation from the surface of human body, what is called 'sultriness', is the result.

The direction of the prevailing wind especially in summer, when it is most needed is between the West and South. The exact angle depends upon a number of local influences which need not be discussed here; to derive the maximum

comfort from this breeze, the bed rooms which are occupied by night must be located in its direction, but if they are directly exposed to the after-noon sun, they are heated and the radiation of their heat by night, as we have seen above, will warm the breeze and make the rooms hot and uncomfortable. Hence deep open verandahs both on the South and West are necessary.

To recapitulate, for proper orientation (a) place all the rooms which are usually occupied by day on the North and East and (b) place the bed rooms on the South and West and provide deep open verandahs to protect them from the heat of the after-noon Sun.

SARAT CHANDRA MUKERJEE

(Old No. 1000, Vol. 12)

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The Plan.

A number of varying factors affects the considerations of planning a domestic building. Hence, no very hard and fast rules could be laid down for general application. In the first place the plan must suit the configuration of the site, also its situation. For instance, the treatment required for a site facing the sea or river is bound to be quite different from that on an open plateau. No two sites could possibly have identical conditions. Individual requirements and idiosyncrasies, which could never be alike, lead to a number of varieties in it. The situation of the site, whether in town, suburb or in the country, plays an important part in the determination of the plan. That, again, differs according to the amount of accommodation required, by reason too of its alternative treatment whether a "detached", "semi-detached", 'flat', chawl, a cottage, or a bungalow and so on. Even in a town it may differ according to the street, neighbourhood, aspect, surroundings, also rental value and restricting by-laws of the local authority.

In spite of this variety certain features which govern the theory of planning are common to buildings of all classes intended to be used for residential purposes. They are enunciated below:—

(1) Aspect, (2) Privacy, (3) Prospect, (4) Grouping, (5) Roominess, (6) Furniture requirements, (7) Sanitation, and (8) Practical considerations.

(1) *Aspect*—By aspect, I mean the peculiarity of the arrangements of the doors and windows in the outside walls of a dwelling, which allows it to enjoy to the utmost, the gifts of nature such as sunshine, breeze, view of the landscape etc. This is a most important consideration in planning. It is a truth, universally admitted, that one's thoughts are moulded by the surroundings; outside influences play an important rôle in the development of the human mind. If they are pleasant and cheerful, people living in their midst are contented and happy; if, on the other hand, they are dull and dismal, they cast a gloomy shadow on their minds. It is, for this reason, those people of humble means living in small cottages, who stand most in need of the two factors viz, Aspect and Prospect.

A building must be designed to suit the site with all its varying aspects. Aspect not only provides comfort but is requisite from the hygienic point of view also. The value of sun's rays cannot be over-estimated. They are potent destroyers of organic poisons of spreading diseases and lend a cheerful and genial air to the rooms. With a careful disposition of windows, it is possible to admit sun's rays into any desired rooms. A kitchen should have an Eastern aspect so that, the morning sun would purify the air in it and it will remain cool in the latter half of the day; the bed rooms should have a S. E. or S. W. aspect; the drawing room, N. E. or S. E. and so on.

(2) *Privacy*.—This is next in importance in the design of domestic dwellings. If they lack in

this respect, it is a deplorable error which cannot be compensated for, by a host of its other merits. Privacy is of two kinds: (a) The one is in respect of screening the interior of any one room from the other rooms of the house and also from the main entrance, while, (b) the other is the privacy of the whole house from the high-ways and by-ways. The latter is comparatively easy to secure by carefully planning the entrance and screening it with trees or creepers trained on a trellis. But the former requires a careful thought in planning. The internal privacy of a domestic house could be maintained by (A) Proper grouping i. e. disposition of various departments and parts of the building in their relation towards each other, which, particularly in economic and compact planning, requires great skill on the part of the architect. (B) Proper disposition of doors. For instance, if a door is fixed in the centre of the shorter wall of a room, the interior of the whole room is exposed to view, whereas if it is fixed in a corner of the larger wall, the larger part of the room is screened. (C) The mode of hanging doors and (D) Provision of a small corridor or lobby. All these methods have been illustrated with concrete examples in the following pages in the notes describing various designs.

Privacy is of supreme importance in the following rooms in particular: bed rooms and all rooms in which sanitary arrangements are usually made such as toilet rooms, water closets and earth closets, urinals, bathrooms etc. The Kitchen department also should be kept out of the view of the passers-by. As far as possible every room except perhaps the

drawing room should have an independent access to it. Again, services such as bathroom, toilet and w. c. should have an independent passage to them from every room and the real skill of the architect lies in so disposing of the rooms with respect to the position of the services that a minimum space is occupied in these passages. This is called compact planning which is the very essence of economical designing.

Privacy is quite different from seclusion. The latter is sought to be secured in a worship room, study and library. A business man's or a manager's office is strictly private, though in the interest of business it cannot be located in a secluded corner; on the contrary it must be situated in a prominent place easily accessible to the public and situated in the centre of various departments.

(3) *Prospect*:—In its proper sense "prospect" has a reference to the impressions that the house will make upon a person looking at it from the outside. It connotes taking full advantage of the beauties of nature in the landscape by revealing to a stranger certain pleasant features and also by concealing from his eye some undesirable ones in the main outlook of the house. The sense of pride that one's house has got a smart, pleasing appearance and the effort to maintain it in that state which occupies part of one's time are potent factors in the amelioration of life of the poor who have otherwise continually to fight against odds and ends in life. Undue prominence, however, should not be given to this feature and it should not be the only or even the principal desideratum in designing

the elevation of domestic dwellings, particularly for housing the middle or poorer classes. Just a small projection here, a bay window there, casually provided to break the dull monotony at a small extra cost, which, considering the benefits it gives, is not only justifiable but necessary. This should not, however, be treated as an extra item in the estimate and considerable money spent over it. Bay windows not only fulfil this requirement but in addition, help in giving breeze and sunny aspect all the year round. Some of the forms of bay windows are shown below:—

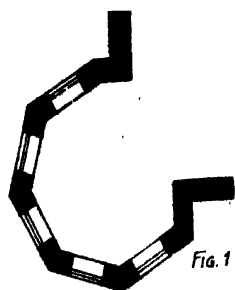


Fig. 1

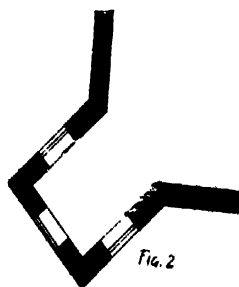


Fig. 2

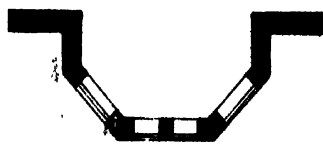


Fig. 3

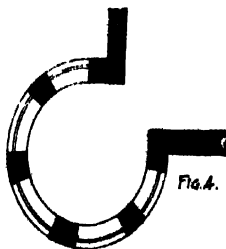


Fig. 4.



Fig. 5



Fig. 6



Fig. 7.

Grouping:—Grouping means the disposition of rooms in respect of their relative positions towards each other. If a building fails in this respect no amount of care taken in all others, is of any avail. The dining room must be close to the kitchen, the latter, again, must be away from the drawing or main living room; otherwise, kitchen smells and smoke would detract from their usefulness. Services must be nearer to, and independently accessible from, every bed-room. The w. c. s., etc. must be far removed from the kitchen and dining room, and so on. This subject has been treated in detail later on in a special section under “grouping”.

Roominess:—Roominess is the opposite of crampedness. It has a reference to the effect produced by making the best of small proportions of rooms, by deriving the maximum benefit from the minimum dimensions of a room or to accomplish economy of space and at the same time avoid cramping of the plan. It looks so simple at first sight, but is really so difficult an art, that it often taxes the brains of the architect. A room whose walls are disproportionately high, looks much smaller than it actually is. Similarly, if the length of a room exceeds $1\frac{1}{2}$ times its width, it produces an effect of crampedness. A square room looks smaller and in respect of utility it is really so, as compared with an oblong one of the same superficial floor area. For example, if a small table is placed in the centre of a room, $10' \times 10'$, the small space equally divided on all its four sides is much less useful than the extra space left on two sides of it.

in a room measuring $12' \times 8\frac{1}{2}'$ which has got practically the same area. Every square foot of the area under roof costs from 4 to $5\frac{1}{2}$ rupees. Hence the maximum advantage must be taken of every nook and corner of the house before thinking of making an addition to the plinth area. Plentiful provision of wall cupboards should be made; even the narrowest space under the flights of stairs should not be disregarded. It should be enclosed and turned into a useful store

: PLAN :
: Scale 2-1/2" :

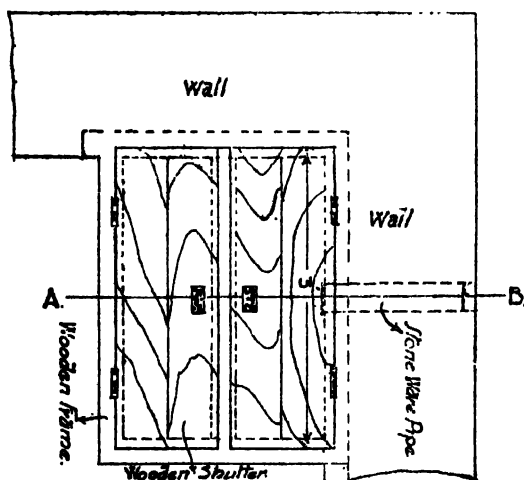


Fig. 8.

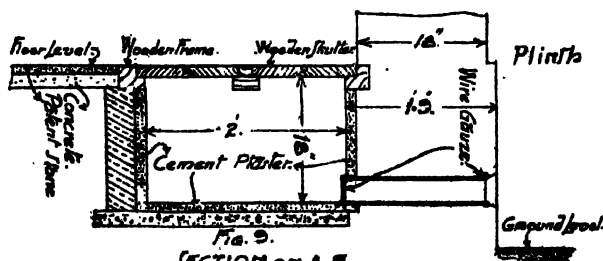


Fig. 9.
SECTION on A.B.

room. The space in walls below window-sills down to the floor level, could be used as a cupboard. This latter arrangement provides a cupboard at a very cheap rate, because no extra lintel or arch is required for this. A very convenient arrangement of an under-ground cupboard is shown in fig. 8 and 9. Provision of such conveniences together with one or two lofts below the ceiling in unimportant rooms and a few wall shelves supported on brackets, would render it unnecessary to set apart a separate store room in small cottages.

Furniture requirements:-This matter, though of a considerable importance is often most neglected. A bed room must be designed with due thought and attention to the prospective position of the bed. Otherwise the latter has to be cramped up somewhere in it, either in a position exposed to view, or opposite to a window facing a strong draught of wind. Even now, I can vividly picture before my eyes, a house of a friend, visited sometime ago, elaborately treated in respect of rich external decoration, in which a room was too small to accommodate a small table in the centre with sufficient elbow room all around it; another room could not accommodate a bed in any position without coming in the way of either a wardrobe or a window. It is best, therefore, to show in the plan the positions, not only of beds, but also of heavy pieces of furniture such as sofas, almyrrahs and chesterfield suites and even of pegs.

Sanitation:-Sanitation is of very great importance for a dwelling; because on it depend

the health and the happiness of the inmates. Sanitation embodies provision of ample light and ventilation and due attention to general cleanliness and sanitary conveniences.

Light—Absence of light has a deleterious effect even on plants, which, if placed in a dark room, soon lose their lustre and often times droop and die. People who have to work in mines, cellars and other dark places look pale and anæmic. This is due to the fact that light acts directly upon the corpuscles of blood which is made to flow vigorously with its natural bright red hue. Sun's light, not even direct but diffused, is found to be potent to destroy germs of tuberculosis. Hence too much stress cannot be laid on lighting the house as profusely as possible. There should not be a single corner in the whole house which is not sufficiently lighted. Particular care must be taken to light passages and stair-cases—the places where there are chances of collision and accidents taking place. As far as possible long and narrow passages which are difficult to be sufficiently lighted should be avoided. If they are at all unavoidable, sky-lights should be provided in addition.

Cleanliness :—This includes also the means provided for cleansing. In India water carriage and sewerage systems have developed only in a few big cities. There, it is comparatively easy to keep the premises clean, but in other cities and towns and in all rural districts this matter is very much neglected. In this connection the following extract taken from Dr. Poore's Rural Hygiene will be found to be very useful. In country districts every cottage ought to

have a bit of garden—about $\frac{1}{8}$ of an acre or more, and adopt the following system of sanitation:—

(1) “All excrement should be kept out of the drains; for, by doing this the putrefaction of the solid is prevented and the purification of the liquid by filtration through the earth is effected with ease, which is proportionate to the thinness of the fluid.

(2) All solid matter should be removed every day from the immediate neighbourhood of the house and buried in the top layer of cultivated ground. This surface layer is full of living organisms which rapidly disintegrate and oxidise any substance deposited in it, until in a very short time—in summer, within less than a week in tropical countries like India—the filth becomes fertile “humus” or mould. Household slops should be poured on to the surface of the garden and the mistake of attempting what is called subsoil irrigation must not be made.

(3) Earth closets with moveable pails should be outside the dwelling house, approached by a covered passage, with a cross ventilation. Sifted garden mould, taken from the top layer and dried in a shed—not by a stove—is most suitable for use. If specially constructed, as in Denmark, Sweden, and Norway so as to separate liquid from solid deposits and, if kept from household slops and other liquids, earth closets are, not only free from nuisance, but will provide valuable manure.

(4) With regard to other solid refuse, the rules must be—

(1) That whatever is capable of rotting must be put in a heap to humify.

(2) Whatever is not capable of rotting must be burnt.

(5) As for domestic slop water, it must never be discharged from the house below the level of the ground. The coarser impurities must be strained out by passing it through filter of gravel or cinders and in its transit to the filter bed it should be kept freely exposed to air in its entire course. If this is done, the exposure to air, sun, heat, cold and drying winds, hold putrefaction in check, and render impossible, the escape of foul gases into the house. The key to success is the separation, in every possible way, of solids from liquids."

Dust is a great enemy of health and its proper importance is not adequately understood in India. Most of the diseases are spread by it; hence, one should strive to minimise the chances of accumulation of dust and other objectionable matter. This could be done in the following ways:—

(1) No mouldings, even skirtings and cornices, should be allowed, particularly on the inner surface of walls. (2) Ledges, nooks, crevices and all unseen spaces which could possibly give dust a lodgement, should be avoided. (3) All edges and corners should be rounded. (4) Angles made by junctions of walls with floors and ceilings should be rounded. (5) Non-absorbent materials like glazed tiles should be provided in the w.c.s and kitchens for flooring and skirting all round of walls. (6) Trellis work in verandahs should have large apertures to facilitate cleaning, and railing of galleries and balconies should be of a plain and simple design for being easily cleaned.

Ventilation:—In providing windows for ventilation, particularly in chawls and flats, the habits of the people likely to inhabit them should be taken into account. Over-ventilation does no harm, while under-ventilation is full of it. Hence there should be a tendency to err on the safer side by providing more ventilation than absolutely necessary. In designing chawls and flats a provision should be made for sufficient ventilation even though the windows may be closed for fear of draught as is the wont of the people occupying them. This could be done by providing floor ventilators in the walls facing an open space. They should be about 18 inches long and 5 inches high, closed by fixed venetians or “hit and miss” sliding shutters as

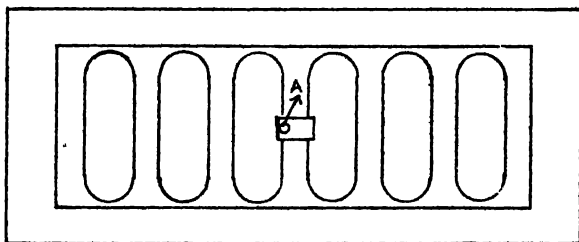


FIG. 10

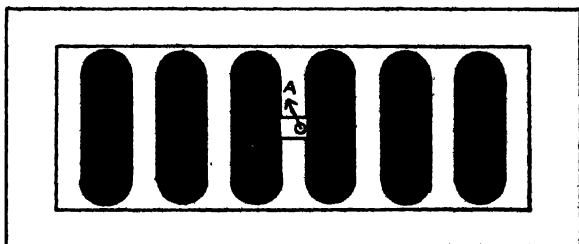


FIG. 11

shown in the sketch (see fig. 10 and 11). Whenever there is a high wind which is likely to cause an exposure to a man sleeping on the floor (which is the practice in many parts of India) the movement of

the button A, one inch either way, could partially or wholly close the apertures. In addition to these, ridge ventilators, near the ceiling, are required. For these, either bull's eyes or clerestory windows should be provided a little below the ceiling; or better still the main windows should be carried to within 6 inches or a foot below the ceiling. The theory is, that the lower strata of air in a room which are warmed by the human breath and to a certain extent by the radiation of heat from human bodies, and having become lighter by the warmth, rise to the top. Unless efficient means like windows near the ceiling are provided for driving them out, they are likely to cool down, become heavy again, and descend, and have to be breathed in again. They are injurious to health because, they are devoid of oxygen, which has been already used up.

Ventilation means much more than simply supplying fresh air to a room. It also connotes the evacuation of the vitiated air and the maintenance of a movement of air in the house.

For a thorough ventilation one large window situated in the centre of an outer wall is not sufficient, but there should be another window or windows in the opposite wall. Thus windows are necessary even in the interior walls for the sake of ventilation. The object of this arrangement is, that fresh air coming through the windows in the outer wall should travel across, from one room to another, through the windows in the inner walls and finally pass out through the windows in the outer walls on the opposite side of the house. This is called "through ventilation." In order that the air in every nook and corner of a room should be

renewed, 2 or 3 apertures distributed over the whole wall, exposed to an open space, are preferable to one large window fixed instead, on it.

The so called effect of "stuffiness" in a crowded room is caused not only by the partial exhaustion of oxygen and the presence of an undue amount of carbonic acid gas in it, but more by the fact that the human exhalations are warm and contain an amount of water vapour. They are, moreover, charged with microscopically small particles of organic matter (part of which also deposits on teeth) which gives foul smell. In addition to this the humidity and warmth, caused by the breath, induce perspiration on bodies of people occupying the room, which also adds to the stink and all these contribute to cause that feeling of 'stuffiness.' Hence the function of a satisfactory ventilation must be fourfold (1) to create a sensation of comfortable coolness to the body (2) freedom from bad smell (3) reduction in humidity and (4) proper supply of oxygen. All this must be secured without producing a perceptible draught.

The relation of window area to that of the room and the cubic capacity of space to be allowed per head are described while dealing with bed rooms under "grouping."

Practical:—The following few hints in connection with planning, would, it is hoped, be appropriate at this place.

(1) Strength and stability coupled with convenience and comfort, should occupy the first place of importance, and embellishment, the next.

(2) Simplicity and effect of strength lend lasting beauty and grandeur to a building which petty plaster mouldings and vain decorations do not. If a moulding is cracked or the edge of a corner knocked off, it is difficult to thoroughly repair it. Colours fade away and unless frequently renewed at a great recurring expenditure, the building on the contrary looks ugly.

(3) One should always bear in mind that a house is called an immoveable property and is calculated to last for several generations. One has, therefore, no right either to practise false economy and have a jerry-built structure which fast depreciates in value requiring continual repairs; or, on the other hand, build, under false ideas of dignity, a costly structure by incurring a heavy debt beyond one's means of repayment.

(4) In the years to come a man may perhaps have to add a wing or extend some part of the house. Provision for this should be made while building in the first instance, so that some part already built, may not be required to be dismantled at that time.

(5) Though a person is hale and hearty and perhaps in the prime of his life now, while building, he should remember that old age with its attendant infirmity, is sure to overtake him, and sickness, human flesh is heir to, may attack him sooner or later in course of time, as it always does in 9 cases out of 10. Hence it is always prudent to have one room preferably on the ground floor designed mainly for comfort which will be a hospital room

for the old and sick member of the family and in times of health and happiness, will prove to be a luxury. This question has been dealt with later on in this book while discussing "grouping" in the next chapter.

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GROUPING.

In this chapter it is intended to take each department such as, drawing room, bed room, kitchen etc. separately and to discuss it in detail with regard to its internal conveniences and its relation to others. But before doing so, it would be well to take specific instances of Indian houses and to consider what accommodation is required in each case.

Let us leave aside the poor cultivators or men belonging to the class of an unskilled labourer, commonly called a 'Coolie'. These, on account of their abject poverty, have to be content with a small verandah and one room which has to serve them as a kitchen, a dining room, a parlour and a bed room, all in one.

Let us take the case of a lower middle class family, belonging, say, to a clerical or artisan class. The minimum requirements in this case are: a verandah, a kitchen-cum-dining room and two bed rooms, the principal one of which serves also as a parlour. People of slightly better means add a dining room, which is also a female apartment, and a closed bath room. People on whom worldly favours have shone still more brightly, require a drawing hall, a dining room, a separate female apartment, with one or two additional bed-rooms according to the number of members in the family.

The air on the first floor being undoubtedly much drier and purer than that on the ground floor, it is desirable to arrange all the bed rooms on the first floor and the remaining apartments such as kitchen, dining room, sitting room etc. on the ground floor. But in India people, particularly those belonging to the middle class, find it more convenient to have all the rooms on the same floor, as it saves them—particularly the ladies of the household—the labour of going up and down the stairs several times a day. Hence semi-detached houses with kitchen, dining, parlour and bath room on the ground floor and bed-rooms on the first floor, do not find favour in India.

It will be seen from the above that the maximum accommodation required by an Indian family consists of (1) a Verandah (2) a Drawing room (3) Bedrooms (4) Kitchen (5) Dining room (6) a Ladies apartment (7) a Store room (8) Worship or prayer room (9) a Bath room (10) a Staircase (11) a W. C. or a latrine.

Detailed discussion of grouping of all these rooms will cover the requirements of families of all grades of society.

(1) A Verandah.

A verandah or a loggia is almost an essential feature of an Indian home as it serves many purposes. Firstly, it is used for keeping shoes, sticks, umbrellas etc. directly as one enters the house; and also for storing prams and cycles. 2ndly, it serves the purpose of a waiting room for a stranger or a visitor before he is ushered into the reception or drawing room. 3rdly, it

serves as a passage giving an independent access to other rooms of the house, thus preserving their privacy. The fourth purpose is its use as a sitting out place in the evening or by night after dinner, enjoying some light reading or post-prandial talks with friends in a flood of cool breeze. In the cottages of people of humble means this is often the main sitting room. The fifth and the most important purpose served by a verandah is, that it protects the walls of the house on that side from being heated by exposure to the sun's rays. This it does in two ways: firstly, by sheltering or screening the wall from the sun's rays and 2ndly, by offering to them a buffer or a sort of cushion of air, which is a very bad conductor of heat. Thus the air entering the rooms behind it, is first cooled down to a considerable extent.

To secure comfort, verandahs on the South and West are indispensable, but if funds permit, they should be provided also on the East and lastly on the North. The latter is rather a luxury than a necessity. If exigencies of money do not permit to provide them on the South and West side, there should be one especially on that particular side on which the bed rooms require protection from the heat of the after-noon sun especially in summer. Not only are verandahs necessary on the ground floor, but also on the upper ones.

When a verandah is required only for mitigating the heat of the summer and not for the purpose of serving as a waiting room, an excellent arrangement is to have a cheap structure built of

wooden ballies or posts supporting a trellis above, on which is trained a vine creeper. The thick foliage which the vine gives forth in summer effectually excludes the sun and cools the hot breeze, and in winter, when its foliage is thin it allows the warmth of the sun to be freely enjoyed. The vine has a luxuriant growth and if well manured and trained it would cover the trellis not only on the ground floor but on the first floor also in a couple of years and would last for many years.

Verandahs are very often specially placed on the East or South-east and so designed, that they should be flooded with the morning sunshine and afterwards when the shutters are closed the sun's heat is, to a certain extent, 'trapped' inside. Such verandahs are called 'Sun-traps' and are most enjoyable in cold climate. The sun's rays have got the power to kill all noxious germs and give healthy and cheerful appearance and purify the air. For this purpose some times special "Sun-baths" are constructed in Western countries. Particularly in the first stage of tuberculosis sun-baths have got, it is said, a great curative effect on persons affected by it. In the latitudes covered by India the sun is very hot in the latter part of the day. However, a few hours' sun-shine in the morning, particularly in winter, is very pleasant. To take full advantage of such a sun-trap, the verandah should be protected by walls on the North and South and there should be windows on the East of the full height of the verandah, closed by glass shutters so that when sufficient sun-shine has been admitted the shutters could be closed.

If a verandah is designed simply for the sake of a passage or corridor giving an independent access to certain rooms, it need not be more than 3 or 4 ft wide. Any width more than this for this purpose is a waste. If, however, it is to be used as a sitting or waiting room, its width should be $6\frac{1}{2}$ ft. as a minimum, (although 7 to 10 ft. would be better), in which case one can conveniently spread a camp cot and lounge on it whenever necessary. Any intermediate width serves neither of these purposes satisfactorily and hence, is practically a waste. There is a disadvantage also from a deep verandah, in as much, as its roof is likely to darken the room inside and make it look dull and gloomy, unless rooflets (also called 'gables') are provided. If the room happens to have one wall exposed to open space, it is possible to light it independently from windows in that side; but if it is a central one, the projecting low verandahs prevent it from being sufficiently lighted which is unavoidable. It is possible to cover the roof of the verandah with glass tiles, but it is both expensive and inconvenient from the heat point of view.

Projecting balconies, which are also a sort of verandah are useful, particularly, when opening from a landing of a stair case. These we see in many of the ancient public buildings such as the Gol Ghumat at Bijapur. After winding on a few steps when one has got a feeling of slight exhaustion, these balconies serve as a resting place where one can breathe fresh air and enjoy a view of the landscape, and are good in that respect. But when they stretch out from windows in private houses, particularly in an urban locality where

houses are not far removed from each other, they do not serve any better purpose than an additional relieving feature in the elevation of the building, which adds elegance to it. It also protects the room inside from the piercing rain, which purpose could be equally served by suitable bonnets over the windows. But this is secured at a sacrifice of considerable amount of money for a small doubtful advantage. From another point of view, they do a positive harm to our neighbours viz., they seriously interfere with the privacy of the neighbouring houses. No one would naturally like to be watched by his neighbours from a projecting balcony.

(2) Drawing Room.

Every cottage, whatever its size, should contain at least one spacious room, call it by whatever name you like, a 'drawing room' a 'parlour' or 'a main or living room'. To the Indian it is almost indispensable. Many and varied are the purposes served by it. It is mainly used as a reception room, as also for holding social functions. It is required to be used as a dining room on special occasions like marriage, feasts etc.; or on holidays when a number of friends are invited to dinner, the drawing room is required for boys and girls of school going age to study their home lessons. It is at times required to accommodate occasional guests who are never wanting in a middle class Indian family; It is also required as a congregation room on occasions of some religious discourse or some such festivities and so on.

The minimum size for a drawing room should be 15 ft. \times 12 ft. It should be well ventilated and lighted with large windows preferably starting from the floor level. The doors especially the one at the front and the other at the rear, should have a minimum size of 3' \times 6' so that pieces of heavy furniture could be easily moved in and out. The position of heavy pieces of furniture such as tables, almyrrahs, suites, sofas etc. should be invariably shown in plan and the positions of wall cupboards etc. should be accordingly fixed. This simple matter, if neglected at this hour, is likely to cause a great inconvenience afterwards.

As regards the position of the drawing room in an Indian home, it is best situated on one side in the house with an entrance from the front verandah. Amongst Europeans it is usually placed near the front door. In that position it occupies a central place which though convenient to the style of living of the Europeans, causes inconvenience in Indian families. It interferes with the free movements and actions of the ladies working in adjoining rooms. Amongst Mahommadan and other communities, where privacy in an exaggerated form, viz. Pardah, is still in vogue, the drawing room in a central position causes a positive inconvenience.

Mouldings of any sort, even cornices and skirtings on the inside of the drawing room, or in fact, of any room, to give a decorative effect should be scrupulously avoided as they present an ideal breeding place for germs of disease,

As far as possible, pegs should not be fixed into the walls at random, some clothing or other is bound to be hung from them which looks unseemly. If necessary, a set of a few pegs should be fixed to the wall in a corner for the purpose.

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A skirting of black japan, coal-tar or a paint of dark, chocolate or slate colour, a foot wide all round the wall above floor, not only looks well, but is sanitarily good and allows the floors to be freely washed with a disinfectant in water without staining the distempered surface.

(3) Bed Rooms.

These are the most important rooms in a house. One spends more than $\frac{1}{3}$ of his life at rest in sleep here. Amongst Europeans two persons are commonly supposed to occupy one room without constituting a case of overcrowding. Thus if there are 5 or 6 persons in a family they require a house with three bed rooms.

It is a pity, that on account of poverty and ignorance of the importance of ventilation, little or no attention is paid in India to this most vital question. In many places, especially among the poor classes residing in villages, the number of occupants of a bedroom is determined by the possible number of mattresses which could be spread on the floor from wall to wall in the room. Four, five, or even more persons are in the habit of sleeping in it. Of course, in many parts of India cots or charpois (four legged coir-matted wooden cots) are a luxury which even the middle classes cannot afford to enjoy. In farmers' huts, even young calves and dogs are allowed to occupy a corner of the same room. The one or two small windows (if such holes, in wall, deserve the term,) that there may be in the walls, are also closed for fear of draught.

* "According to the census report of 1921, there are 1,75,001 one-room tenements in Bombay, giving an average of 4.03 persons per room and no less than 65.8 per cent of the population live in one-room tenements !

Many of the rooms are occupied by more than one family ! The rent of these rooms is from Rs. 10 to 12 per mensem; the average monthly wages of this class is Rs 30 per mensem. The result of all this could be very well imagined. The low vitality, the very high death-rate, anæmia, tuberculosis (particularly in females) and high infant mortality etc. are all directly traceable to the overcrowding in bed rooms. The farmers, who have to work all day in the open field, get pure air by day and thus have got this relieving feature partly to compensate for the overcrowding in bedrooms by night. But the mill hands and other labourers who have to work the whole day in an atmosphere congested with smoke, and who do not get a chance to breathe in free air also by night, fall an easy prey to diseases. In old times, Agriculture was the main industry of India, which required the majority of people to do work in the open air, and that preserved their health. In this industrial age, people are leaving agriculture behind them in the villages and flocking to industrial centres in cities, which have attracted large numbers even from the middle classes who follow pursuits of clerical or other allied nature. Males go out of doors during at least a part of the day, but females have to spend all their time at home doing domestic work, which has resulted in lowering the

general standard of vitality amongst them. It is futile to expect that the children born of such mothers who are the future citizens of India, would be strong and healthy. Therefore, if India wants to live amongst the nations of the world, she must solve this problem of housing the middle and working classes satisfactorily, and the sooner she does it, the better.

The minimum window area, required by the municipal by-laws, is $1/10$ of the floor area. But this should always be exceeded. In domestic buildings a minimum of 350 cubic ft. of space for an adult and 200 c. ft. for every child under ten, should be made while designing bed rooms. Besides this, a suitable allowance should be made for every piece of furniture. However, the quantity (square ft. of window area) and quality (cross and through openings) of ventilation is of greater consequence than either the floor area, or the cubic space allotted per head.

The above considerations will give some clue to the sizes of bed rooms. From a practical point of view $15' \times 12'$ has been found by experience to be a good size for a bed room in the houses for the middle classes. As has already been stated, an oblong room is more convenient, particularly as a bed room, than a square one and that no room should be less than 100 sq. ft. in floor area.

Bed rooms should be placed on the side of the direction of the prevailing wind and if this happens to be the west, the wall on that side should be protected from being heated by the sun's afternoon rays by the provision of a deep verandah on that

side. The ideal conditions are, that the sun should shine in the bed rooms for some part of the day, preferably in the morning, and a free breeze should ventilate it by night.

A small bath room combined with a dressing room attached to bed room, is more or less a modern necessity in the houses of the well-to-do. However, in small cottages, it is desirable to so arrange the bed rooms that the services viz, bath room and the w. c. are easily and independently approachable from every bed room. In the designs given in the following pages, a special attempt has been made in this respect.

(4) Kitchen.

If the room for the kitchen is a spacious one, there is no need of a separate scullery for the Indian manner of living. As far as possible, the kitchen should be in a separate block cut off at least 10 ft. by a covered passage from the main building. However, with this arrangement it is not possible to keep an eye on strangers entering the front door. Besides the ladies feel the isolation of their sphere of life (wherein they practically spend their whole time,) from the rest of the household, and sometimes resent it.

For the Indian manner of living, especially in the cottages of the poor, there is no necessity of a separate dining room if the kitchen is a little more spacious. For this purpose the room should be rather oblong; 10' x 15' to 18 ft. is the best size. The length should be at least $1\frac{1}{2}$ times the width, so that, the actual portion used for dining is far removed from the heat of the chulla range.

There should be as many wall cupboards and shelves in the kitchen as could be accommodated without interfering with the strength of the walls. One of them viz. that for the larder should be situated in a cool corner and should have shutters of perforated zinc or fine wire meshing with "air bricks" behind, for a thorough ventilation. This would be useful for storing milk and its products such as curds, butter, ghee and the like.

There should be at least two windows with half glazed and half perforated zinc plate shutters—one for lighting the chullas and the other for lighting the other part of the room. The provision of half shutters of perforated zinc sheet or fine wire meshing is necessary for the purpose of ventilation and prevention of flies entering the kitchen. Flies are vehicles of disease germs and must be vigilantly guarded against, by making suitable provision for the purpose.

The chullas should be located below an arch 4 ft. wide, 1' 9" deep and 3 ft. high at the centre above the floor level. There should be a hole about 8 inches in diameter at the top of the arch as an outlet for the smoke. This hole should be plastered smooth on the inside while still the masonry work is in progress. This should end at the top in a chimney which should be carried at least 2½ ft. above the ridge.

There should be a small sink near the chulla in the opposite corner with a *Nhani-trap* fixed in its bed. The bed and sides of the sink should be lined with glazed tiles or polished shahabad or katni slabs and if that is found to be too costly the sides should be

lined with cement plaster and the bottom with a whole shahabad piece with a good slope in the corner towards the Nhani-trap.

The kitchen should be placed as far as possible in the corner opposite to the direction of the prevailing wind. In the Deccan, the North-east corner is found to give the best results and South-east the next best, the object being, that the smoke and strong smells emanating from the kitchen, should at once escape out of the house through windows in the outside wall, instead of escaping into other rooms of the house. As an additional precaution towards the latter end, the kitchen should be separated, if possible, by a small lobby; and the doors opening from the kitchen into other rooms, should have no ventilators or fanlights, so that when these doors are closed the kitchen smells are effectually shut out from the living rooms of the house.

(5) Dining Room

If the kitchen is sufficiently spacious, even a verandah on the rear side closed with a dwarf wall 3 ft. high and a trellis work above, will serve the purpose of the dining room in small cottages. When a separate dining room is to be built it should be located as near the kitchen as possible. Provision of one or two cupboards and a few 1/2 inch galvanised iron pipes, galvanised steel wires or at least long bamboos fixed horizontally in wooden blocks fastened to the opposite walls a foot below the ceiling, for drying wet linen, make the arrangements in the dining room complete.

(6) A Ladies' Apartment

This room is a necessity in an Indian family. Ladies do require a separate sitting room to receive their friends and enjoy spare time chats with them. This room also should be airy and well lighted and should be situated near the dining room. In humble cottages, the dining room also serves as a ladies' apartment.

(7) Store Room

This room also is a necessity in houses for the middle classes. In very small cottages roomy wall cupboards and a loft, either in the kitchen or in the dining room, serves the purpose of a store room. One or two underground cupboards (described on p. 40) would be very much appreciated in small cottages in particular. The store room should, as far as possible, be situated near the kitchen and should have a stone paving so as to preclude the possibility of rats entering and making their home there. Rats, not only, do a lot of damage, but also carry on their body, the potential danger of fleas affected by plague. The store room should be well lighted and ventilated and there should be a row of shelves all round. The lowest row should be at least 9 inches above the floor level so that the floor could be easily cleaned and washed of all dust. For an ordinary family a store room of about 10 ft. x 6 ft. should be adequate enough.

In rural districts a bigger store room is required to store staple food grains etc., which are available at a cheaper rate during the harvesting season. Besides a fuel room or a coal cellar spacious enough

to store fuel sufficient for the requirements of 4 months of the monsoon season, is required in addition.

With large families there is always a heap of lumber which though not quite useful, cannot be thrown away. One of the rooms of the detached out-buildings should be devoted to this purpose.

In addition to this, some space for putting bicycles or a perambulator is very often required in the cottages of the middle class people. The space below the flight of stairs is suitable, if the latter be situated not far from the front entrance.

(8) Worship or Prayer Room

Of late, very few people can afford to devote a special room for this purpose especially in cottages in the urban area, for many reasons. The chief amongst them is, that one finds very little time for this purpose in the midst of a modern busy life. 2ndly, the space is very much restricted and thirdly, there is a want of funds for building on any more area that what is absolutely necessary. In the up-country places all these things are favourable. There is any amount of leisure; site is unrestricted in extent, and the building materials and labour are comparatively cheaper. If a provision of this room is desired, it should be situated in a secluded part of the house, free from disturbance of any sort. It should be well ventilated and lighted, but there should be an arrangement to make the room partially dark when required. Slight darkness particularly combined with seclusion tends to

increase] the solemnity which is very much desirable in this room for inducing concentration of mind.

(9) Bath Room

The main bath room should be on the ground floor and near the kitchen. If a hot water boiler is to be kept in the bath room a minimum size required for it, is 6' x 10'. If used only for bath purposes 5' x 8' is a sufficient and convenient size. There should be two windows in a bath room—one for ventilation, situated at a height of 5 ft. above the floor level and another at a low level with frosted glass shutters for admitting light but maintaining privacy. It is convenient in small cottages to keep the height of the bath room low (say about 7½ or 8 ft.) and to provide a loft above it for storing fuel or any other articles of lumber. The loft should be well lighted and ventilated and it should have a hinged door of expanded metal to keep rats out.

The Indian way of taking a bath requires some part of the floor say 3' x 3' preferably that in a corner to be lowered in level by about 3 inches than the remaining and a smoothly dressed stone 18" x 18" and about 6 inches high, fixed in the centre for squatting, while taking a bath. The entire floor of the bathroom and the inside lining of the wall to a height of about 4 ft should preferably be of white glazed tiles, or, if its cost be found to be prohibitive, the floor should be paved with Shahabad or some other kind of slabs and the sides with cement plaster. As far as possible lime in the form of mortar or calcareous composition of

flagstones, should not be allowed at least in the sink or the lowered part of the floor, as urine, which contains an acid, acts chemically on the calcareous matter, and unless copious water is poured for flushing immediately after use, it causes a bad stink and wears the stone away. Even trapstone paving is preferable in rural districts, though from a sanitary point of view a smooth surface cannot be given to it so easily. A Nhani trap should be fixed in the bottom of the sink towards which the floor should slope. In no case should the water be allowed to stagnate near the house. It causes not only damp, but also breeds mosquito-larvæ.

The provision of a corner—shelf at 5½ft for keeping a soapbox, a towel rack, another corner-shelf 9 inches above the floor level with perforations for draining off water from wet and soiled linen and a shower-tap, if feasible and necessary, make the arrangements in the bath room complete.

Whether water is heated in a boiler or in an open copper pot placed on a chulla, a smoke outlet is a necessity; still to preclude the possibility of the smoke entering the house, the main bathroom should be located in a place opposite to the direction of the prevailing wind and should have no ventilators over the doors opening into other rooms from the bath room.

Though a bathroom attached to every bed room is a luxury which only the rich people can afford, there should be, in addition to the main one, a common bathroom, which guests and other occasional visitors, could use without encroaching upon the privacy of the family. If bed rooms are

located on the first floor, there should be a bathroom equipped in all respects, also on the first floor with an independent passage to it from each bedroom.

(10) Staircase

The staircase is the main thoroughfare of intercommunication between the floors and as such is of very great importance. But generally there is a tendency with people, of effecting an economy of space in this particular respect at a sacrifice of considerable comfort. If the upper floor is exclusively devoted to bedrooms, the staircase could be located at any convenient place inside the house. But if some of the rooms on it are to be used as sitting rooms as well, which outsiders may occasionally visit, the position of the staircase must be such as will afford it an entrance independent of the other rooms on the ground floor. That is why many people like to post it in the front verandah. If it is situated in the latter place, another staircase on the rear side, for the use of the ladies, will add much to the convenience and privacy of the household.

In order that a staircase may be comfortable it must satisfy the following requirements:

(1) It should be airy and well lit.

(2) The stairs should be easy and comfortable. There are two rules for guidance to determine the mutual relation between the tread and riser: one is,

$$\text{tread} \times \text{riser} = 66 \text{ inches}$$

and the other is,

$$\text{tread} + 2 \times \text{riser} = 23 \text{ to } 24 \text{ inches.}$$

Note:—The limiting dimensions are, that the riser should never be more than 8 inches and the tread less than 9 inches. 6" riser and 11" tread are very satisfactory dimensions; 6½" and 10" are next best. These will be appreciated by old people and invalids who find stairs in general difficult to negotiate.

(3) There should be at least 6½ ft clear headway above any step.

(4) The width of the stairs in a winding flight should be the same as in the straight one.

(5) The stairs should be sufficiently wide (3½, if not 4 ft.) so that two people should be able to stand abreast comfortably and pass by each other. It also easily permits pieces of heavy furniture to be carried to upper floor. This precept, however, in Indian cottages, is honoured more in the breach than in the observance. 3 ft is the minimum width required even in the smallest cottages.

(6) As a rule a staircase should not have triangular or winding steps at all. Not only do they tax the ingenuity of carpet layers, but they cause a positive harm. Firstly, people going down the stairs are much more likely to slip on the "winders" than on the stright steps and, secondly, if they slip they fall down a large number of stairs which is likely to make the fall a serious one. Young children are very susceptible to this in particular. It is therefore prudent to leave no chance for possible risks by spending a few rupees more and altogether avoiding winders *even at the sacrifice of an easy riser*. If for exigencies of

space they are unavoidable, they should be at the beginning of the flight near the ground, so that, if a fall does occur at all, it should not be a severe one.

(7) As far as possible the height of the risers should be uniform. A difference of even $\frac{1}{2}$ inch in the height of one single step, though not quite apparent to the eye, is at once susceptible to one's legs and causes one to startle and stumble.

(9) Each flight should have not less than three steps at least, and as far as possible the number of stairs in each flight should be uniform.

(10) The staircase should, as a rule, be fire-proof, especially if there be only one.

(11) Not more than 10 steps should come together in one flight. But this is not always possible.

(12) A staircase just in front of a house gives a poor appearance. Aesthetically a geometrical staircase (one having three or more flights at right angles to each other) is good. It also affords easy facilities for lighting and its "well", or the central hollow portion, forms a good position for a lift. But it involves a danger in case of an outbreak of fire, as it provides an air chamber and a sort of chimney which causes the conflagration to spread. Moreover, it totally blocks the descent under those circumstances.

In flats and tenement houses in particular, unless there is a separate emergency exit, the staircase should necessarily be fireproof.

Comfort Room.

You may be strong and stout, and your entire family enjoying excellent health, now, at the time of building your house; but you should not lose sight of the rainy-day too. There is every chance of yourself or some one of your family falling sick, some time in future. Again, it is likely that there might be some aged or an infirm person in the house dependent on you—why, you yourself cannot escape old age in course of time. Hence, it is prudent to have in view one room mainly designed for comfort of the aged and the sickly, which can be properly called a “hospital or a sick room”, but at the time of building a new house in the expectation of health and happiness, the word may sound rather inauspicious or freakish, hence, to follow M. Coule and make it *suggestive*, let us call it a “Comfort Room.” For being really comfortable, it should satisfy the following requirements :—

(1) It should preferably be on the ground floor to save the sick or the aged person, the troubles of going up and down the stairs. If there be any lift for the purpose, then the 1st floor, which is healthier, is preferable, still there should be an easy staircase without any winding steps, for use in times of a possible break-down of the lift.

(2) A bath room, and a w. c., where there is a water carriage system, or a commode arrangement where there is a conservancy system, should be quite close to it, preferably in an ante-room.

(3) The room should be so situated that it will be flooded by the morning sunshine, and will also get

a free breeze by night. A south-east corner would be appropriate for this reason, with a verandah on the South.

(4) In the cottages for the middle classes it should not be far removed from the kitchen, so that it should be possible for the ladies to attend or render prompt service especially to the aged who are not in need of a constant attendance. Still, it is advisable to have another room, close to the comfort room which an attendant could occupy.

(5) There should be windows for ample light and a thorough ventilation, with blinds for obscuring light whenever necessary. Some sick persons find strong light unbearable.

(6) The room should be rather commodious; 15' x 12' is a good size, but that depends upon the size of the cottage to be built. The floor should be of such material as will permit of easy washing and cleaning with a disinfectant.

Architectural Treatment

"Architecture is the material expression of the wants, the faculties, and the sentiments of the age in which it is created. Style in architecture is the peculiar form which that expression takes under the influence of climate and materials at command"—Ellis A. Davidson.

As we expect in all truthful matters that the outward forms and shows should correspond with the inner feelings and emotions, otherwise we condemn it as insincerity, so in buildings, too, an artistic elevation should be accompanied by a convenient and comfortable accommodation of plan. Hence, while planning buildings attention must be given simultaneously to both these things. The proper course is, to plan the inside arrangements first, with a view to comfort and convenience, and then to give it an architectural expression to suit. The former is more difficult to accomplish; the latter is comparatively easy, only if one is prepared to ignore the restrictions of his purse.

"Construction should be decorated. Decoration should never be purposely constructed. That which is beautiful is true. That which is true must be beautiful"—Owen Jones.

If we see the origin of the beautiful features in architecture, we shall find that most of them, if not all, were originally introduced to serve some necessary useful purpose. For example—the projecting cornice of the window sill or the string

course at floor-level of the upper story was first introduced to prevent rain water running down the outer surface of walls from entering the house. The *chhajjas*, for mitigating effects of heat and the glare of the sun, and also to serve as a weather board; the arch, because of its strength to resist the superincumbent weight; latticed *jalis* (pierced screens), for protection from heat, and so on. Therefore every architectural feature must justify its existence from the point of view of utility.

It is a pity, however, that in actual practice, in the enthusiasm to show an artistic taste, undue importance is given to the outward expression of beauty and large amounts wasted on vain decoration. This is often done even at a sacrifice of internal conveniences. If comfort and conveniences have to be compromised for the sake of architectural appearance, it is not a decoration but an abomination.

What is it that constitutes the charm and attraction in an elevation? What particular factors or features contribute to give pleasure to the eye and joy to the mind? To be able to give a correct answer we must pause a little to reflect on the effect produced on our minds by the sight of a beautiful object. If we cast a glance, for instance, at the famous *Taj* or any other beautiful structure, a sensation of pleasure is caused in our minds and at the same time a permanent indelible impression of the object is created before our minds' eye. Now, if we just analyse the impression or the picture before our mind, we shall find that it consists of the general outline of the structure, seen in one general

colour harmoniously matching with the surrounding landscape. The various colours with which it is decorated cannot be seen from a distance and are not individually responsible for the impression. Nor can even the carving, and other ornamentation have any effect on it, because they are too numerous in detail and have to be studied at close quarters to be properly appreciated. Thus, it is the general outline—the bold and clear-cut features of the structure, seen in the landscape, which have imprinted themselves on the mind.

This clearly shows the folly of spending money lavishly on vain embellishment which serves no good purpose, but on the contrary as seen on page 44 from a sanitary point of view, does a positive harm by affording a lodgement for dust. The style and form of the building, which determine the outline, are the real things that count and have to be attended to.

The style of the plan in old times was of one set, stereotyped form, and that was chiefly concerned with a symmetrical front. Of late years a school of architects has arisen who are not satisfied with symmetry. They have widened their field of choice, and they lay their plans on principles of irregularity, quaintness and surprise. Symmetry does not attract their eyes. Their argument against it is, if symmetry was first introduced with a view to copying nature in which all human beings and in fact, most animals present a symmetrical front, then why not carry the principle a little further and design symmetrically also the inside of the buildings? Because if a

median line is imagined in animals, the functions of all the members on the right side of the body are similar to those on the left, perhaps with a few exceptions. Again, leaving aside the animal world, if we observe the plant life, we find that Nature, on the contrary, is distinctly opposed to symmetry. The tree sets forth branches at random, take any flower and you will find no two petals to be alike. Thus, from the view point of this school of architects, that elevation of a building is smart and attractive, which brings into bold relief, certain features which though seemingly irregular, come as a surprise. Of course, this must all be in keeping with the basic principles of architecture or in fact of all decorative art viz. fitness, proportion and harmony, the combination of which give repose as a result.

Such deviations from the usual order of symmetrical fronts are shown in a great variety in the elevations given in the pages that follow.

The character of the building must harmonise with the surrounding landscape to give it an effect of repose. If, for instance, the site slopes steeply give the building a vertical treatment. If it is a flat plateau of open country, let it have a character of breadth. Vertical treatment consists of a high plinth; thin, tall pillars; narrow, pointed arches; narrow windows; high-pitched roof, etc. The broad or horizontal treatment on the other hand, requires a massive appearance with broad low steps; massive and comparatively short pillars; broad and low windows, with lintels, or flat or elliptical low arches; flat, terraced or broad, expanding low-pitched

roof; and so on. As another instance, if, on the top of a barren rocky hill, a building with plaster mouldings is constructed, it is sure to cause a discord. What is required in such a place is a structure of massive rustic stones, having bold, clear-cut features.

Though harmony must predominate to give an effect of repose, there must be a variety, or contrast without which harmony is sure to produce an effect of dull monotony. In fact, while trying to bring about harmony, with the beauties of landscape, what we can at most do is, to approach nature particularly in respect of tints of colours. It is impossible to produce colours exactly similar to those of Nature. Hence in imitating Nature we remove the discord and come closer together towards it, but not merge into it.

The contrast, however, must not be so striking as to be painful to the eye. What is required is a "harmonious contrast" which makes the features maintain their individual impression and still do not produce a discord.

This harmonious contrast is more applicable to, nay, is the very essence of, the effect produced by different colours. If a colour wholly merges into another it cannot be seen at all. In order to make itself distinctly visible it must have its own individual shade contrasting against that of the back-ground, but not at the same time producing a jarring effect in its association with the surrounding colours.

The common error made in the development of the modern elevation of buildings is the eclectic

tendency, i. e. to say, the mixing up of several heterogeneous things to produce something which neither belongs to this, nor to that particular order. The main characteristics of the Indian architecture lie in the breadth and horizontality. If we just cast a glance at any of the ancient monuments, we will not fail invariably to see everything massive and comparatively low in height,—horizontal lines predominating to produce an effect of breadth in the whole structure. The cornices or string courses dividing different floors; projecting galleries; verandahs; terraces open to sky with parapet walls all around; pierced screens or latticed windows; chhajjas; flat arches; etc. are matters of pure Indian Architecture. Sash windows, protruding small porches, high-pitched or mansard roofs, slate covering, high extending chimneys, in most cases symmetrically placed, stucco-plaster, dormer windows, are features of the English Architecture.

The predominating material used has a direct bearing on the elevation of the building. A stone building gives an effect of strength; and especially if the stones are massive, that of grandeur; while a brick building particularly if it is plastered and coloured on the outside, gives an effect of delicacy. There should be one predominating material and colour, and not a jumble of too many materials and too much detail. Every quaint little bit must justify its existence.

Large areas of plain wall, proper disposition of doors and windows in the outside wall, harmony of colours of the parts of the building with that of the

whole structure, and of the latter with the surrounding landscape, are things which considerably affect the beauty of the building.

Additional effect, if desired, could be obtained by making slight deviations from the simple square plan. The simplest form is L shaped, which not only gives a better appearance, but is also convenient and comfortable in tropical climate. Other forms resemble the letters T, H and U, each one of which has got its own peculiar merits.

Projecting one part of the building a little

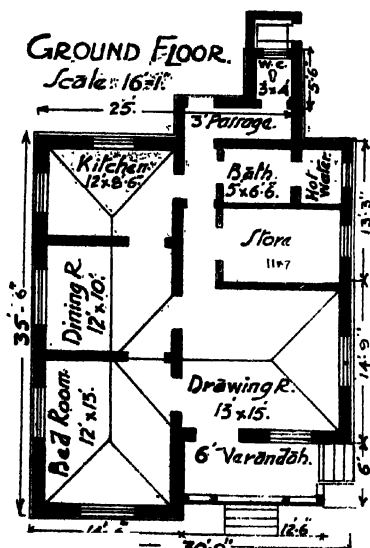
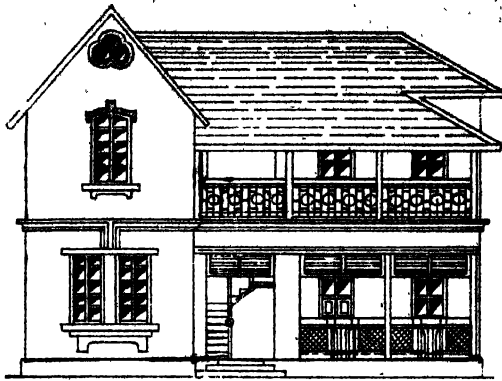


FIG. 12



FIG. 13

beyond the rest (see fig. 12) gives an additional effect. Gabled roof is generally constructed over



FRONT ELEVATION

Scale. 16-1.

FIG. 14

such projections (see fig. 14), but even a hipped one if properly constructed as in fig. 13 gives an effect of repose. This arrangement far outweighs the little extra cost involved in the projection.

Sufficient mention has been already made on

FRONT ELEVATION.

Scale. 10-1

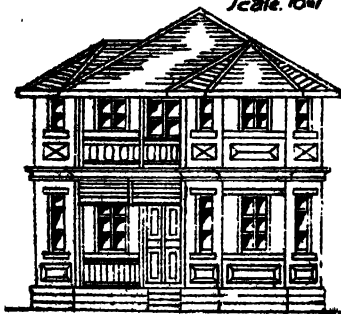


FIG. 15



FRONT ELEVATION

FIG. 16

page 38 about bay-windows which afford immense possibilities of imparting a charm to the elevations of buildings, besides being useful in giving a sunny aspect. Figs. 15 and 16 show two such cottages having bay windows.

Projecting doorways or entrance porches are

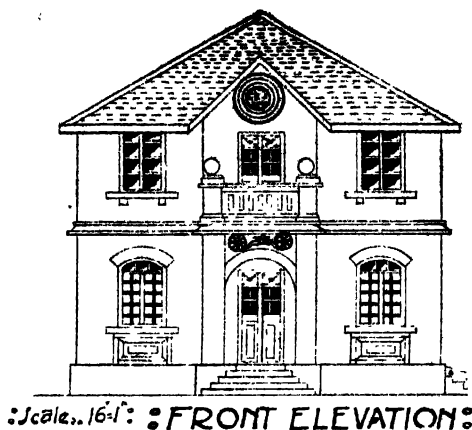


FIG. 17

another item full of opportunities of improving the appearance of the front. Fig. 17 shows the front elevation of a cottage with a projecting entrance porch, over which is constructed a terraced roof. An effect of beauty is still further obtained by the gablet in the central portion of the roof with a bull's eye in the triangular portion.

Chimney stacks, particularly when they are symmetrically grouped together, give a repose; but in India there are very few such cold places where fire places are required.

Roof is a very important feature in cottage decoration. A high pitch or steep slope no doubt gives a better appearance but in tropical countries like India where absence from snow does not justify it, it involves an unnecessary expenditure and is quite foreign to Indian architecture.

Fig. 18 shows an elevation of another cottage in which a side-view of the entrance porch is shown. Mark the effect brought out by the simple stucco plaster on the surface of brick masonry supporting the water tank on the rear side.

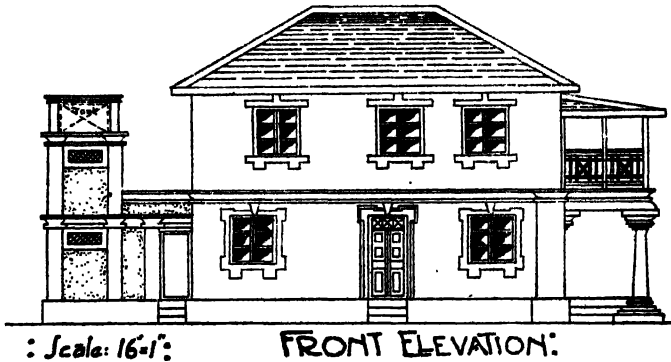


FIG. 18

Gablets, which are also often called rooflets,

FRONT ELEVATION.

Scale. 16=1.

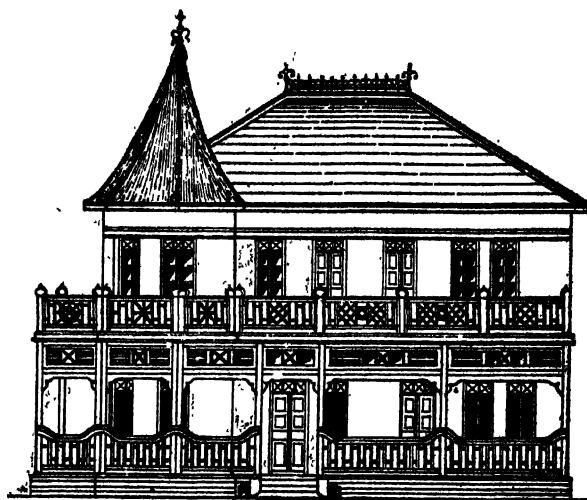


FIG. 19

never fail to give a smart appearance (see figs. 17 & 19). They provide, in addition, facilities for more light and ventilation and therefore the extra money which they require is not only justifiable, but some times necessary. In fig. 19 the trellis work in the front, has added to the effect of simplicity and composure of the elevation.

The parapet wall enclosing a flat or terraced roof affords facilities of a variety of decoration in different designs of panels, cornices, copings and rain water spouts.

Fig. 20 shows the effect produced by a small

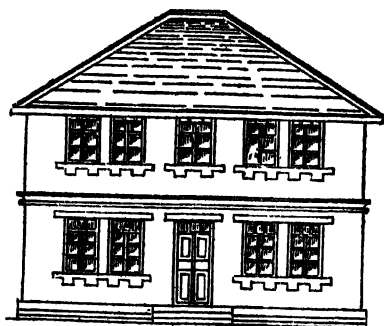


: FRONT ELEVATION.

FIG. 20

turret over a bay window. Mark the plain design of the railing in front of the verandah on the ground and first floors which admits of easy cleaning.

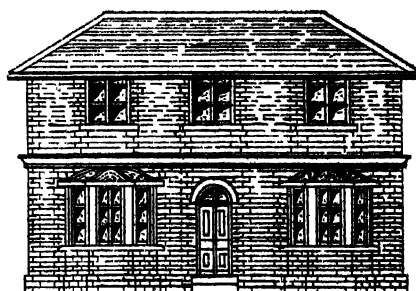
The air of calm composure and serenity given



FRONT ELEVATION:

— Scale. 16'-1" —

FIG. 21



Scale. 16'-1"

FRONT ELEVATION.

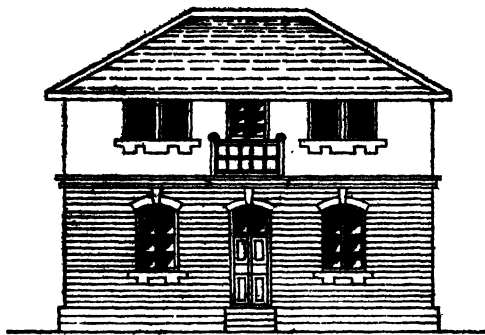
FIG. 22

by symmetry is shown in figs. 21 and 22. The simple but beautiful shape given to the sills of the windows in fig. 21, adds to the beauty of elevation. The separate detached roofs over the bay windows in fig. No. 22 make the elevation look picturesque.

This effect could be obtained even by bonnets

over plain windows which not only add to the beauty but also protect the room from the heat of the sunshine and piercing rain.

Fig. 23 shows another symmetrical elevation with a projecting balcony



FRONT ELEVATION.
Scale 16'-1"

FIG. 23

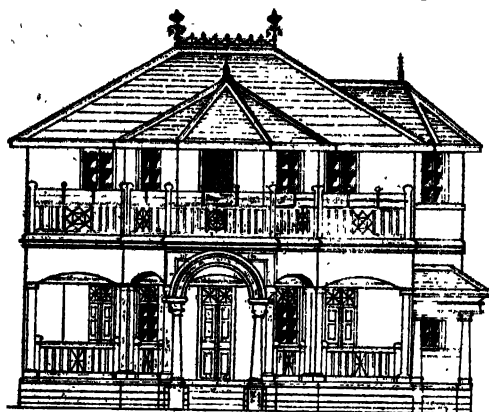
in the centre. Fig. 24 shows still another in which, mark how the central gablet in the roof and the rough cast plaster on either side in the form of panels make the elevation look graceful.

FRONT ELEVATION.
Scale 16'-1"



FIG. 24

When brick is the predominant material



: FRONT ELEVATION :

FIG. 25

used it affords immense opportunities for simple, modest decoration, without costly ornamental plastered surface. The colour of the brick, as well as its bond, as seen in joints in the front surface, the width and finish of the

mortar joints etc. give a variety of treatment. If any special decorative effect is desired to be given to brick-work, it should be sparingly done for emphasizing special features such as entrance, arches, pilasters, parapets, cornices etc. Arch work in brick masonry costs very little, as compared with stone, and at once enhances the beautiful effect. Similarly octagonal or round pillars of brick or R. C. C., slightly tapering towards the top, conspicuously attract the eye (see fig. 25).

Another advantage of brick work is that it allows its outer surface to be plastered in a number of ways to produce an effect of beauty, e. g. rough cast, smooth cast, plain coloured etc., and the intermingling of these. A great effect could be given by the colour of the plastered surface. Light colours mixed with cement generally do not fade away. If borders of doors and windows are

given a different treatment from that of the remaining surface, which might either be left plain or rough cast another beautiful effect is produced. In fig. 24 corners are left plain and the remaining surface plastered rough. In fig. 26, in the elevation of the upper floor, the reverse of this is done i. e. corners are rough plastered and the intermediate surface left plain.



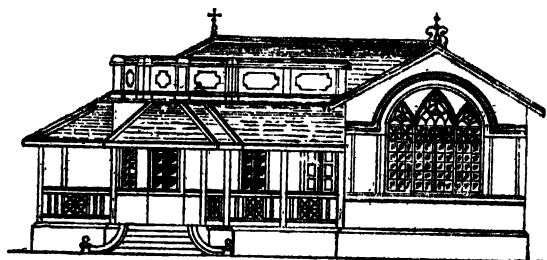
FRONT ELEVATION.

FIG. 26

In stone masonry various methods of dressing and the degree of smoothness to which it is done such as rough or rustic, draft-edged and rough tooled or bushed surface, chamfered and bevelled edges, medium, smooth dressed or polished and so on. The variation in thickness of courses—thicker courses at bottom, gives another effect. Dressing quoins smooth and leaving other surface rustic, gives still another effect. Using stones of slightly different colour for corners and window-sills gives a pleasing appearance.

Sometimes a combination of stone and brick is made, stone is used for the ground floor and brick in the first and upper floors or stones are used only for corners and bricks for the intermediate masonry. (see the ground floor in fig. 26)

Instead of laying stones in regular lines of courses which often produces an effect of monotony, they are often laid at random. If they are selected of more or less uniform size and so laid, that the use of spauls or small stones is avoided, they present a very beautiful surface.



: FRONT ELEVATION :

FIG. 27

In fig. 27 note the panelled surface of the parapet wall enclosing a terrace, also the architectural shape given to the front steps. The semi-circular arch in the gabled wall is further sub-divided into small pointed arches.

Furniture and Interior Decoration

The principal object of furnishing and decorating a house is to secure health and comfort. Whatever is pleasing to the eye is pleasing to the mind and beneficial to the body. Thus the beauty of form and colour which gladdens the mind is also conducive to comfort and health. The main factors affecting health are air, light and cleanliness. Hence, anything, howsoever elegant and beautiful, which interferes with any of these essentials is to be condemned.

It is a fortunate thing that wall papers, for which highly insanitary articles such as glue and paste, are required are rarely used in India.

The modern pieces of furniture such as, chairs, tables etc. were really speaking unknown to our ancestors. At best, the purely Indian furniture consisted of a chowrung (four-legged low wooden stool), a swing, with a planked board to sit upon, and bedstead; carpets, with mattresses for squatting and cushions for reclining, being in use from time immemorial. Of late years as a result of the contact and communication with the Western people, the European dress slowly came to be adopted and with it chairs and tables which are necessary for it. They have now become a common feature in every home, whether adopting European or Indian style of dress, and thus a taste for furniture has been created; in so far as this taste provides an additional industry to the

nation and to a certain extent contributes towards solving the problem of unemployment, it deserves to be encouraged. However, our national trait of a partiality for simplicity—plain living and high thinking—will always predominate above all. Hence, pieces chosen should be as few in number and as simple and plain in design as possible. They should not interfere with either light or ventilation, nor should they allow dust to lodge on their surface. For artistic effect, greater stress should be laid on elegance of form and charm of simplicity than on elaborate carving and architectural ornamentation. They should again, be capable of being easily moved aside on castors fixed to the bottom of their legs, so that the floor surface underneath them could be easily cleaned.

Plants in Rooms

In Western countries a decorative effect is obtained by cultivating plants in flower pots inside the rooms. This is a very good thing, and should by all means, be universally adopted in our country. Not only do they give an appearance of freshness and liveliness to the room, but also help to purify the air during the day time. Their action on air is, on the whole, the reverse of that of animals.

It is true, that plants respire like animals, breathing in oxygen and giving out carbonic acid gas. But, this process of respiration is very slow and is hardly perceptible during the night. On the other hand, the respiration during the day time is very insignificant with the reverse process of Assimilation, in which the green matter in the

leaves actually decomposes the useless carbonic acid gas under the influence of light and gives out a large amount of oxygen for the benefit of animals. On the whole, the presence of green plants inside the house is very beneficial. The air inside the house is charged with a certain amount of smoke which contains some elements such as sulphur compounds, particularly in the house where gas is used for cooking and lighting purposes. These are detrimental to the plant life. There are only a few plants such as a few varieties of cactus, some palms, and a few ferns which possess the power to resist these evil effects.

A small conservatory on the flat or terraced roof would, not only, add to the beauty of the house, but would be most enjoyable as a resort in the evening even for poor families who cannot afford luxurious conservatories in the cottage compound. It may here be suggested that excellent boxes of plants could be easily and cheaply constructed in the top layer of the parapet walls of terraced roofs. For this purpose the upper one foot layer of parapet walls should be lined on both sides with brick-on-edge masonry or 2 inches thick cement concrete walls on both sides with a few small holes for the aeration of plant roots; the central hollow should then be filled with earth and leaf-mould manure, in which a bed of roses or any other sort of plants may be cultivated.

Colours

Colours used in decoration have a powerful influence on the human mind. They act on the

nerves through the medium of senses. People in robust health may not feel their effects immediately, but the invalid and the sensitive are very susceptible to their influence. If they are in harmony, a sensation of pleasure is caused. If, however, they are discordant, an irritation of nerves, even amounting to headache, is the result. In spite of this, the majority of people are ignorant of the theory and effects of colours. The real artistic taste is found to be developed only in a few people. What commonly passes for artistic taste is more or less an imitation of what "men of taste" have done. It is therefore proposed to discuss here very briefly the elementary principles of colours.

What are called *Primary Colours*, are only three viz. *Yellow*, *Red* and *Blue*. All other colours are produced by compounding these in different proportions, but the former are not themselves capable of being produced by composition of other colours. Hence they are called primary.

Secondary colours are three viz, *Orange* (Red + Yellow), *Green* (Yellow + Blue), *Purple* or *Violet* (Blue + Red).

Tertiary colours, again, are three viz, *Citrine* (greenish yellow—green + orange) *Russet*, (warm brown—orange + purple) and *Olive* (dull brownish green—purple + green).

Besides these, there is a variety of colours called *Neutral* colours. They are *White*, *Black* and *Grey*. White and black mixed in certain proportions produce grey.

White is the colour used for softening or reducing the purity of other colours in their original tints and making them look more vivid. Black is used as a shade or depth colour.

The distinction between a *tint*, *hue* and *shade* is worth remembering. By mixing white with an original colour, *Tint* of the same colour is produced; by mixing a colour with another colour, a compound colour or *Hue* is produced; and by mixing tints of colours with black, *Shades* are produced.

Colours on white back-ground look darker and those on black back-ground, appear lighter.

When two tones of the same colour are juxtaposed, the light colour looks still lighter and dark, darker.

The various colours should be so blended that the surface coloured should present a neutralised bloom.

Characteristics of colours :—

White is the most advancing of all colours i. e. it catches the eye first before other colours with which it may have been mixed or juxtaposed, by rendering their tints lighter and more vivid. White is expressive of purity and cleanliness and is sanitary looking. It absorbs heat least and radiates it most readily.

Black is the freakest variety and is the lowest in the series. It most contrasts with white. It can be skilfully used to give a soothing effect and break monotony or uniformity of other colours. It is an opposite extreme of white in respect of absorption and radiation of heat.

Yellow, next to white, is the most advancing colour, it is indicative of delicacy and gaudiness and is often called a sunlight colour, it stimulates the nerves, often causing irritation, if it is deep in tint. The contrasting colour of yellow is purple inclining to blue.

Red is the most stimulating of all colours, so much so, that it irritates the nerves, tires the eye and causes an after-feeling of depression, the result of over-stimulation. It is very agreeable and charming when in juxtaposition with green. It partakes of warmth. It appears to deepen in shade or vanishing light.

Blue is the most retiring colour. Next to dark it contrasts best with white. It is a cool colour and is very powerful in strong light. It gives a soothing effect and is suitable in bed rooms. It causes a discord when it comes in juxtaposition with green. To correct its coldness it should be contrasted with white or orange. Blue is very agreeable to the eye in all harmonious combinations whether in juxtaposition or mixtures.

Orange, like yellow, is very advancing and is also called a sunlight colour; it is healthy, stimulating and a cold colour. It causes a discord with red or yellow and forms an agreeable combination with blue. It is more effective at a distance.

Green is the most soothing, cool and restful colour. It least excites the retina and hence is very much appreciated by the nervous system. Its discording colour is blue. Green is the Nature's most favourite colour and particularly when it

contrasts with red in Nature it looks very charming and delightful. Its coolness can be cured, if necessary, by mixing some yellow in it.

Purple is, next to green, agreeable to the eye; it is cool and refreshing. It is regarded as the imperial or majestic colour. Its contrasting colour is yellow.

Grey is a neutral colour; it causes a soothing, restful impression on the mind. It is particularly good in sunny rooms, where the sunshine corrects its coldness.

Brown is a warm colour, it is indicative of strength, stability, vigour and comfort. It forms an excellent back-ground for pictures. Hence it is very often used in bed rooms. It is the proper colour for prayer or worship rooms as it helps in giving them an air of gravity and solemnity.

Cream is one of the very soothing colours and is generally preferred for parlours, office-rooms etc.

Cool colours should be used in sunny rooms and *Warm* ones in the sunless ones.

Parlours should be treated with blue, grey cream; bed-rooms with green, brown, pink, orange, blue or purple; verandahs, with cream, blue or green; office room, with cream or grey; kitchen and dining rooms with yellow. Bath and toilet rooms, white. The walls of the room in which pictures and beautiful scenes are to be hung should be coloured with a simple quiet, light colour to serve as a back-ground for pictures.

Grey or white borders in corners and round door and window openings give an effect of smallness to the room. If the colour of the skirting matches with that of the floor or floor carpets, it gives an effect of width to the room.

There is always a personal factor or individual taste in respect of colours. What one person wants to shun, may be most appreciated by another. There are even some people who are colour blind. All that can be done, therefore, is, to acquaint the reader with certain principles commonly accepted and this has been attempted above.

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Mitigation of Heat

The question of mitigating heat is as much important in tropical countries like India, as that of warming and heating is, in the Western countries for the attainment of comfort. It would, therefore, be not inappropriate here to make a few remarks about it.

All heat is derived from the sun and is felt as a result of either conduction, radiation or convection. We are not much concerned with the first, because the sun's rays while passing through the layers of air in the atmosphere do not materially heat them, air being a very bad conductor of heat. We are mainly concerned with radiation. Convection, as far as it affects us, is a result of radiation. Land is a better conductor of heat than water, hence it absorbs more heat of the sun by day and is heated more than water in the sea. In consequence of this the temperature of the air, in contact with land, rises more than that of the air in contact with water, which makes it lighter and rise to top, its place being taken by colder air from the sea (sea-breeze).

It is thus the radiation of the sun's heat absorbed by the materials, of which a house is constructed which affects the temperature of air in the house. The only remedy to minimise the effects of this heat is the use of highly non-conducting materials. By far the best material in this respect is air, which is the worst conductor of heat. We can use air for protection from sides in two ways. (1) by pro-

vision of deep verandahs, which has been already discussed on a previous occasion in detail (see pages 33 and 51), and need not be reiterated here, and (2) by constructing hollow walls, which is a very effective remedy. But hollow bricks are not much in use in India; besides, unless scrupulous care is taken during construction, mortar is likely to fill in the hollow space which is very narrow and thus defeat the very object. This is, again, objectionable from a sanitary point of view, because, if anything decays or putrefies in the hollow space it is difficult to remove it.

Enclosing an air space below the roof is a very effectual remedy. Wood is a very bad conductor of heat; hence, if plank ceiling is constructed and $1\frac{1}{2}" \times 1"$ battens spaced $2\frac{1}{2}$ ft. apart fixed vertically and $1" \times 1"$ battens are horizontally nailed on their top for receiving Mangalore tiles, an air space of $2\frac{1}{2}"$ deep is left which makes the rooms cool and comfortable. In addition to this the materials used in the exposed surface of walls and roof should be bad conductors of heat.

Stone absorbs more heat than brick. Hence, brick houses are cooler than those of stone. Mortar i. e. plaster is a worse conductor than either brick or stone. Earth or clay is a still worse conductor. Therefore walls of unburnt bricks or of *pise de terre* make the house more comfortable. That is why flat mud-roofs are cooler than concrete terraced roofs, which, again, are cooler than tiled ones.

Out of metals used in building construction, copper is a very good conductor, brass stands 2nd, steel and iron 3rd, and lead, last of all.

The colour of the surface exposed to sun's radiant heat has a great effect on heat. White absorbs least heat, which it radiates again most readily. Its opposite extreme is black which absorbs it most and radiates, least. The intermediate between these in their order of less absorption and more radiation are yellow, green, blue and red. White-washing the outside surface of walls is a very effectual remedy. Slates used for roof-covering which are of stone, and hence absorb considerable heat, could be rendered cooler by colouring them with a white wash.

Under-ground cellars, as they are not exposed to sun, remain cool. However, it is not possible to provide a thorough ventilation in them unless artificial means are employed. They are, again, likely to be affected by damp.

Perspiration is a usual concomittant of discomfort due to heat. Air in motion tends to lessen it and hence the importance of thorough ventilation. This has been already touched upon on pages 32 and 47.

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Narendra Nath Mukerjee P. 11

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Analysis of cost.

The factors which affect the cost of buildings are:—

- (1) Cost of labour
- (2) Cost of materials
- (3) Proportion of cost of labour and of materials to the total cost
- (4) Proportional cost of each item of work to the total cost.

(1) *Cost of labour*:—The average result of the analysis of costs of nine buildings of various types, built both in towns and rural district, goes to prove that the cost on account of labour is 34·6, (say roughly 35) per cent of the total cost, and that on account of materials is 65 per cent.

How this 35 % money is distributed will be seen from the following table:—

Trade	percent.
Excavator and Concretor	4
Mason (Laying stone or brick masonry plastering, paving, pointing etc.) ...	35·5
Carpenter and joiner	21·5
Smith	2·0
Fitter	2·6
Ghaniwalla (mortar grinder)	6·3
Electrician	2·8
Painter	3·6
Plumber	4·0
Tiler	1·5
Supervisor	15·0
Miscellaneous (Fencing, clearing site, glazier etc.)	1·2
	100·0

The cost of labour is dependent on (a) rates of wages (b) efficiency of labour and (c) period of working hours.

(a) If the rates of wages of different trades prior to 1914, (i. e. before the Great War broke out), are compared with those current at present (1930), it will be seen that the average rise is *101 per cent.* They reached the highest level in 1919 and have, since then, remained practically stationary. The table given below indicates the rise in the rates of wages of different trades in detail:—

Trade	Rate of wages						Percentage rise	
	1914			1930				
	Rs.	as.	ps.	Rs.	as.	ps.		
Male Coolie	...	0	4	0	0	10	0	150
Female Coolie	...	0	2	6	0	6	0	140
Mason	...	1	0	0	1	12	0	75
Carpenter	...	1	0	0	1	12	0	75
Bhistie	...	0	12	0	1	4	0	67
Black-smith	...	0	12	0	1	12	0	133
Painter	...	0	12	0	1	4	0	67
Bullock Cart	...	1	0	0	2	0	0	100

Note:—The rates quoted above are those prevalent in the Poona District and are of the average class. Thus, for instance, the wages of a first class mason are Rs. 2 per day and those of a 2nd class mason are Rs. 1-8; therefore the average of the two, viz, Rs. 1-12 is taken.

In rural districts unskilled labour is cheaper than in urban area. For instance, a male coolie can be had at annas nine per day beyond 10 miles of Poona and at annas eight per day beyond 25 miles.

But skilled labour, or artisans who have to be imported from town for work in villages at extra rates, are costly. The local artisans are generally inefficient and give work which is less in quantity and inferior in quality; hence, they prove to be very costly in the long run. And, as the proportion of the cost of the skilled and unskilled labour, severally to the total cost on account of labour in a building work of an ordinary character is almost equal, viz, 51 p. c. and 49 p. c., the total cost of labour is ultimately the same both in rural as well as in urban areas.

(b) Efficiency of labour is a great factor in reducing the cost of a building. The Indian labourers, in general, lack a sense of duty. Their general tendency is to scamp work. It is, therefore, upon the maistry who directly supervises the work that the success, in economy, depends. He is not only responsible for good or bad work, but also for the diligence or slothfulness of the labourers under him. Instead of trying to keep all labourers all the while busy under his eye, he should allot a certain task work to each trade, so that, the quantity of work would be guaranteed. As regards the quality he should test it from time to time. The maistry must, therefore, know not only what good work means, but also what quantity or task one must finish for the rate one draws.

(c) Of course, the quantity of work is proportionate to the number of working hours. There is no fixed limit for working hours in India except under the Factory Act. Hence work is done from sunrise to sunset. Thus varying seasons allow a varying number of hours. In summer they are 20

to 25 per cent more than those in winter. Instead of insisting upon a fixed period, it is better to depend upon the task work executed.

(2) *Cost of materials*:—The following table shows a comparison of prices of building materials between the pre-war (1914) and the present time (1930).

Material	Unit	Prices		Per- centage in- crease.
		1914	1930	
		Rs. a. p.	Rs. a. p.	p. c.
Rubble (trap)	100 C. ft.	6 0 0	10 0 0	67
Burnt brick (table-moulded)	1000 Nos	12 0 0	21 0 0	75
Slaked lime	100 C. ft.	30 0 0	40 0 0	33
Trap metal 1½"	100 C. ft.	5 8 0	11 0 0	100
Timber (country cut teak)	C. ft.	2 8 0	4 8 0	80
Do Moulmein	"	4 0 0	6 0 0	50
Sand (river)	100 C. ft.	4 0 0	8 0 0	100
Mangalore tiles	1000 Nos	70 0 0	100 0 0	43
Do ridge do	100	30 0 0	45 0 0	50
Cement	ton	62 8 0	58 0 0	-7.2
Charcoal	Maund	1 12 0	2 8 0	43
C. I. sheets	Cwt.	11 8 0	11 4 0	-2.5
Zinc paint	"	30 0 0	48 0 0	60
Mild steel	"	7 8 0	7 0 0	-6.7
Linseed oil	gallon	2 8 0	4 8 0	80
Distemper	Cwt.	27 0 0	54 0 0	100
Glass panes	each	0 4 0	0 5 6	37.5
Surati lime	40 lbs.	1 0 0	1 8 0	50
Coal tar	cask	20 0 0	30 0 0	50

The average rise in the prices of materials may be taken to be 70 p. c. Cement and to a small extent iron and C. I. sheets are the only materials which have become cheaper than the pre-war rates.

The combined effect of the rise both in the rates of wages and of prices of materials is a gener-

al rise of 86 per cent in the total cost of a building over the pre-war price.

(3) The subjoined table shows the different proportions which the cost of unskilled labour, skilled labour and materials, bear to the total cost of each item of work:—

Item.	Cost of Material	Cost of Skilled labour.	Cost of unskilled labour.
Excavation	* 10	...	90
Concrete	70	...	30
Uncoursed rubble masonry	70	20	10
Coursed rubble 2nd sort do.	56	25	19
do. do. 3rd do.	56	20	24
Brick-work	66	17	17
Lime pointing to stone masonry	18	57	25
do. Brick-work	20	60	20
Rough cast plaster	56	28	16
Cement plaster	64	25	11
Concrete jack arches	73	3	24
Brick-work do.	78	14	8
Plank ceiling	79	8	13
Manglore tiled roofing	81	11	8
C. I. Sheet roofing	76	10	14
Country tile roofing	71	11	18
Terraced roof	80	13	7
Doors panelled	69	23	8
do. $\frac{1}{2}$ glazed $\frac{1}{2}$ panelled	69	23	8
do. plane plankd	76	18	6
Windows glazed	69	22	9
do. Plane plankd	82	13	5
do. Iron barred	84	7	9
Distempering	57	19	24
White-washing	31	38	31
Wire fencing	79	17	4
Teak wood trellis work	45	45	10

* Some times foundation trenches have to be excavated deep in soil, earth, or soft shadu and the sides have to be protected by shoring. The proportionate cost on account of this has been taken into account here.

(4) Proportionate cost of each item to that of the total work.

This is very important, because it gives a clue to the various directions in which economies of money could be effected. The following table, in which the average result worked out from observations of details of expenditure of 7 buildings, 6 of which were cottages and one a flat, are given. Although it is not quite exhaustive, it is, nevertheless, capable of throwing a flood of light on where the money goes:—

Trade	per cent cost
Excavator and Concretor	4.5
Mason (Wall of brick, stones etc.)	34.4
Carpenter and joiner	22.0
Fitter and iron-monger	3.3
Plasterer	7.1
Pavier	5.0
Floorer (flooring supported on Walls)	13.2
Tiler	4.8
Painter	3.2
Plumber	2.5
	100.0

The table given below shows the percentage of cost which each item of estimate bears to the total cost of the building:—

Item	percentage of cost
Excavation for foundations and filling in concrete	4.5
Masonry up to plinth	9.2
Masonry of super-structure	23.3
Doors	10.2
Windows and cupboards	8.5
R. C. C. lintels over doors and windows	2.3
Flooring (Supported on Walls)	13.2
Paving	5.0
Wood-work (post, post-plate, shelves, lofts, trellis, trusses etc.)	9.0
Stairs	2.7
Roofing	5.3
Water closet	2.8
Drainage and gutters	1.8
Fencing and miscellaneous	2.2
Total.....	100.0

***Some facts about building costs**

(1) The average cost on account of labour in a building amounts to 35 per cent and that on account of materials 65 per cent.

(2) $\frac{2}{3}$ amount is required for the skeleton and $\frac{1}{3}$ for finishing such as tiling, plastering, painting etc.

(3) On an average the cost up to plinth level is Re. 1 to $1\frac{1}{4}$ per square foot.

* For a detailed explanation of these facts borne out by figures of calculation the reader is requested to refer to the author's "Sulabh-Vastu-Shastra." (to be had from the author. Price Rs 3 per copy, postage extra.)

(4) Mud mortar of good earth is no less durable than lime mortar provided sufficient safeguards are taken in respect of drainage, viz, (a) protecting exposed wall surface with lime or cement pointing or rough cast plaster, (b) constructing a perfectly water-tight roof and (c) building walls from foundations up to plinth in lime-mortar.

(5) When the rate of sound burnt bricks, $9" \times 4\frac{1}{4}" \times 2\frac{3}{4}"$ per 1000 (number) is less than $2\frac{1}{2}$ times the rate of sound rubble per 100 cft. brick masonry is cheaper than stone masonry. Moreover, brick possesses innumerable other advantages over stone.

(6) A timber framed structure with stone or brick in mud walls costs more than a *pucca* structure of stone or brick in mortar, unless the outer walls also of the framed structure are reduced in thickness of half or one brick i. e. $4\frac{1}{2}"$ or 9". The latter however, is objectionable from the point of view of heat and raids of thieves.

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Business Aspect of House Property.

The rental value of a building is determined by the following factors.

- 1 The interest on capital outlay
- 2 Working expenses
- 3 Profit

Under capital outlay come the following:

- (a) Cost of site including legal expenses
- (b) Cost of development, such as, levelling, drainage, water-supply, roads, fencing, garden.
- (c) Cost of building including that of out-houses such as stables, garage, servant's quarters, lumber room etc.

Out of these, (a) cost of site depends upon locality, nature of soil and foundation, water supply, position etc. and is a greatly varying factor. As regards (b) the cost of a 20 ft. wide metalled road with cross drainage works such as culverts, pipe-drains etc. of ordinary type may be taken at Rs. 3 per foot length and that of drainage of 4 inches stone-ware pipes suitable for a single house with traps, inspection chambers etc. at annas twelve per foot. Pipes, less than 4" diameter, are not allowed for house drainage (c) The cost of building depends upon a number of factors, its size—the incidence of cost of small buildings is more than that of large houses, a two storied building costs less than either a single storied or more than 3 storied one, it also

depends upon the specifications and materials used. Fastidious insistence of absolutely flawless materials is bound to increase the cost. Bay windows, turrets, angles and projections etc. are sure to increase the cost and so on.

Under (2) working expenses come the following:—

- (a) Repairs and renewal charges
- (b) Supervision, collection of rents and management
- (c) Rates and taxes
- (d) Lighting, water, insurance.

The interest charges and the rents being more or less fixed quantities, maximum profits occur if the working expenses are reduced to a minimum.

The following facts should be remembered in connection with reducing the repairs charges.

(a) A substantially built dwelling requires less repairs.

(b) A chawl or tenement house requires more repairs than a flat, which, again, costs more for repairs than a cottage type dwelling. This is mostly due to two reasons (1) The people living in flats and cottages belong to a higher grade of society than those in chawls and have got a better sense of keeping things in a state of repairs and (2) chawls and to a certain extent flats are used in common by different people and therefore the responsibility of keeping the building in a state of repairs is commonly shared, whereas it has to be shouldered by one family living in a cottage.

(3) The financial position of the landlord is an indirect though a sure factor affecting the cost of repairs. If it is sound, he can adopt a "stitch in time policy" which really saves him "Nine". If the repairs are delayed or neglected, Nature requires him to pay penal charges ten times those of the prompt repairs.

(4) The treatment meted out to the tenants also indirectly affects the repairs bill. If it is full of courtesy and kindness and if the owner is ever willing to respond to the request to remove the little *reasonable* inconveniences of the tenants particularly in respect of repairs, they, on their part too, take better care of the property with a resulting reduction in the repairs bill.

(5) It is prudent to fix a slightly less rent in the first instance and to secure the good will and with it the permanency of tenants than charging unreasonably high rents and giving a cause to them to make frequent shifts which results in loss of rent due to bad debt and empties. Besides the property also suffers damage by its careless use by too many irresponsible people.

(6) If the house is well planned and well built the losses on account of empties are very little.

(7) There are less chances of losses resulting from quarters remaining untenanted if they are built in small cottages suitable for middle classes or still better, flats suitable for poor classes than building one big house suitable for one rich family.

Repairs and renewal charges amount from $\frac{1}{4}$ p c. to $\frac{3}{4}$ p c. of the capital cost per year or 5 to 15 p. c. of the gross rental.

(b) Supervision and collection charges vary from 0 to 4 p. c. of the gross rental, depending upon the extent of the property and the class of people inhabiting it. If the property is small it could be very easily managed by the landlord himself; if large, permanent establishment has to be maintained.

(c) Rates and taxes vary from 5 to 18 p. c. of the rental

(d) The charges on account of lighting, water-supply and insurance vary very much.

(3) *Profits*.—If the property belongs to one individual person or a family, whatever balance remains out of the rental collected after setting aside the requisite amounts to cover the working expenses and interest on capital cost, is appropriated as the profit. If the property belongs to a company, a part of it varying from 1 to 2 per cent of the capital cost or 5 to 10 p. c. of gross rent is credited to sinking fund, another suitable part is set apart as reserve fund and the balance is distributed as a dividend on the amount of the share capital. If the property belongs to a public body, the whole amount of net profit is carried to reserve fund.

The total working expenses on account of all the above causes amount to from 20 to 40 p. c. of the gross rental. On an average 3 to 4 months gross rent should suffice to meet all the repair charges.

Introduction to Plans

The plans in the following pages have been divided into 5 classes:—(1) Bungalows; (2) Storeyed Cottages; (3) Terrace Houses; (4) Flats (5) Mansions and Palaces.

The word “bungalow” has been used in this book in a sense rather different from what is commonly understood in India. It is popularly interpreted to mean any commodious, pretentious cottage whether storeyed or not. But in this book it has been used to mean a single storeyed house or a ground floor structure without an upper storey. ‘Terrace’ houses are houses with a narrow frontage, built, attached to each other by a common wall, in rows lining a street. They derive their light and air in two directions only viz, the front and the rear. They are far superior to chawls or tenement houses which equally lack facilities for ventilation, and in addition, do not give any privacy outside the room door. The terrace houses, if their party walls be sound-proof are quite independent separate units with a small open yard either in the front, or rear or both, also separated by party walls from the adjoining units. The chawls deserve to be condemned and discouraged as far as possible, hence, I have not considered them at all in the present volume.

Mention has been already made in the main introduction about the costs of buildings given in the book. They are likely to vary according to the fluctuations of costs of labour and material. However, they will be useful to give some rough idea, at

least for comparison of one plan with another. The rates of labour and material on which they are based are given in the statements on pages 100 & 102.

In most of the plans in addition to the plinth area, figures of carpet or living areas are also given. In calculating them the area occupied by walls, lobbies, verandahs less than 5ft. in width, bath room and W. C. are deducted from the plinth area. This living area bears a certain proportion to the plinth area, and the higher this proportion is the more compact and economic is the design. It varies from 55 per cent to 80 per cent; but in cottages which are supposed to be an economical type of buildings it should never be less than 65% in bungalows and 62% in storied cottages.

A word in explanation of the sanitary arrangements shown in a number of plans is necessary here. The question of fixing the position of a W. C. in a house, so that instead of being a source of nuisance, it should add to the convenience, always presents some difficulties. Hence, they have been specially given for guidance of people living in towns where water carriage system is adopted. In rural districts and towns where there is no water carriage system, any other use of the space such as a godown store, bath room etc could be made or in some cases where feasible their area should be incorporated in that of the living rooms, and privies built in a detached position. Similarly, as construction of a pitched roof in a proper manner is not always easy, roof-lines are shown on most of the plans. In Northern and Central India, where flat roofs are constructed they may be omitted.

A Key to the Reading of Plans.

For the guidance of some laymen who have seldom seen plans, a typical plan is given below in fig 28, which, it is hoped will make all subsequent ones easily intelligible.

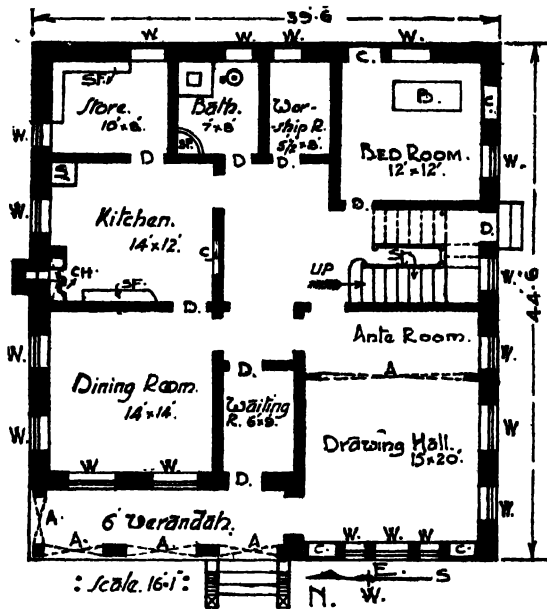


FIG. 28

° GROUND FLOOR PLAN °

A, A, (Diagonal dotted cross lines), indicate arches; W, W, (Double lines along walls near the outer edge), windows; O, O, (Recess in walls), cupboards; D, D, (Breaks in walls), doors; St, staircase; OH, chulla; S, sink; SF, Shelf; B (Rectangular fig. in bed room), position of bed. N, (The arrow on the right, in the front). Shows the North direction. The present plan faces West.

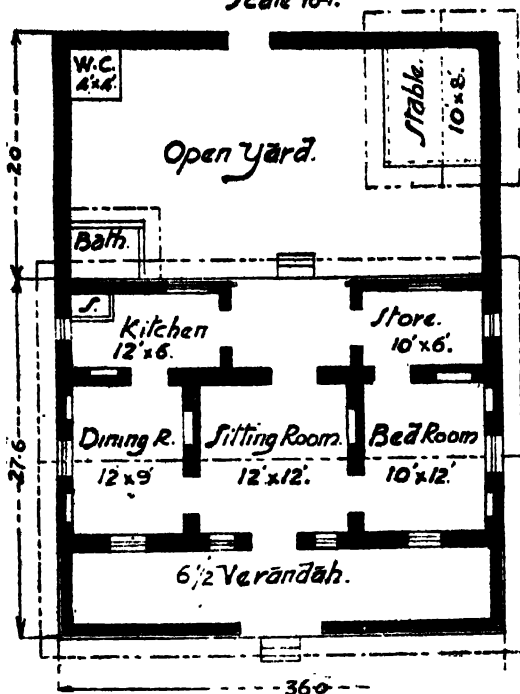
BUNGALOWS.

Plinth Area 990] PLAN No. 1 [Cost Rs. 3450.

This type of cottage is suitable in rural country

GROUND FLOOR

Scale 16'-1."



FRONT ELEVATION.

Scale 16'-1."



FIG. 29
and 30

where a self-contained little villa enclosed by a small compound wall is required. It should prefer-

ably face North or North-east. Both the front and rear verandahs are closed by 3ft. dwarf walls of brick nogging and wooden trellis work above. The light in the central sitting room is likely to be slightly obscured, still it is the coolest room in the whole cottage. The old village houses were built on the same system as this one with a central sitting room and closed verandahs all round. Ordinarily the verandah on the rear side is sufficient for the purposes of a dining room for a small family. In that event the dining room could be used as a bed room. When a few friends are invited to dinner the dining room or the central sitting room could be utilised for the purpose. A small removeable curtain across the front verandah on one side of the entrance would make a small room for boys of school going age to do their home lessons. The bath room is detached in a corner adjoining kitchen in the rear yard. It is further screened by the compound wall. A small cow-shed or stable for a pony in the rear yard with an exit gate in the compound wall make the arrangements complete. A loft below the roof of the stable provides room for storing fodder for the animal. In the opposite corner the position of a privy is shown. A small cheap shed over the area between the stable and the store room would be very useful for storing fuel. The plinth area of the cottage is 990 sq. ft and the living area 784 which bears a proportion of 79 per cent to the former. Thus the plan is one of the most economic ones. The building, with stone in mud walls lime pointed on the outside and a roof of round country tiles is actually built and has cost 3450 Rs. including the compound wall.

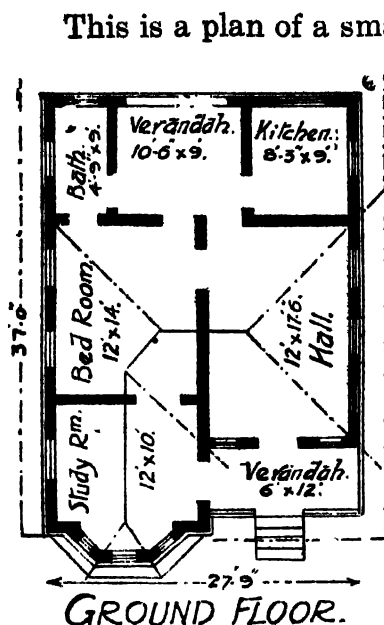
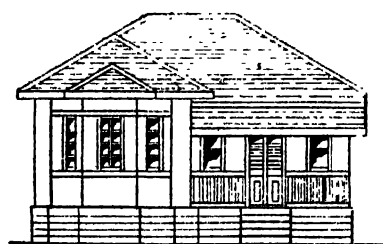


FIG. 31



FRONT ELEVATION.

Scale 16-1.

FIG. 32

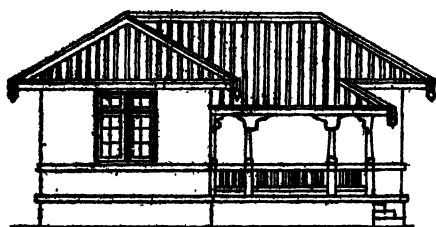
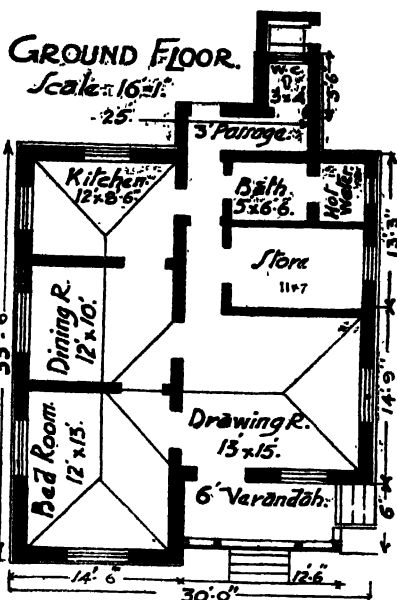
all the necessary accommodation commonly required by a small Indian family. The size of the parlour is really excellent. The front verandah will serve as a waiting room and the one on the rear side as a dining room. The two bed rooms one of which is called study room in the plan are spacious enough. The bay window in the front considerably adds to the beauty of elevation. The roof is quite simple involving only one valley. The plan is suitable for a South or a South-east facing. All the outer walls are $1\frac{1}{2}$ brick thick and inner ones one brick thick. The plinth area is 1050 sq. ft. and the

living area 745 which bears a proportion of 71 per cent to the former. The cost is about 4100 Rs. with a *pucca* structure of Brick in lime masonry.

Plinth Area 1024] PLAN NO. 3

[Cost Rs. 4500

This is a plan of a small cottage convenient



FRONT ELEVATION
Scale 16'-1"

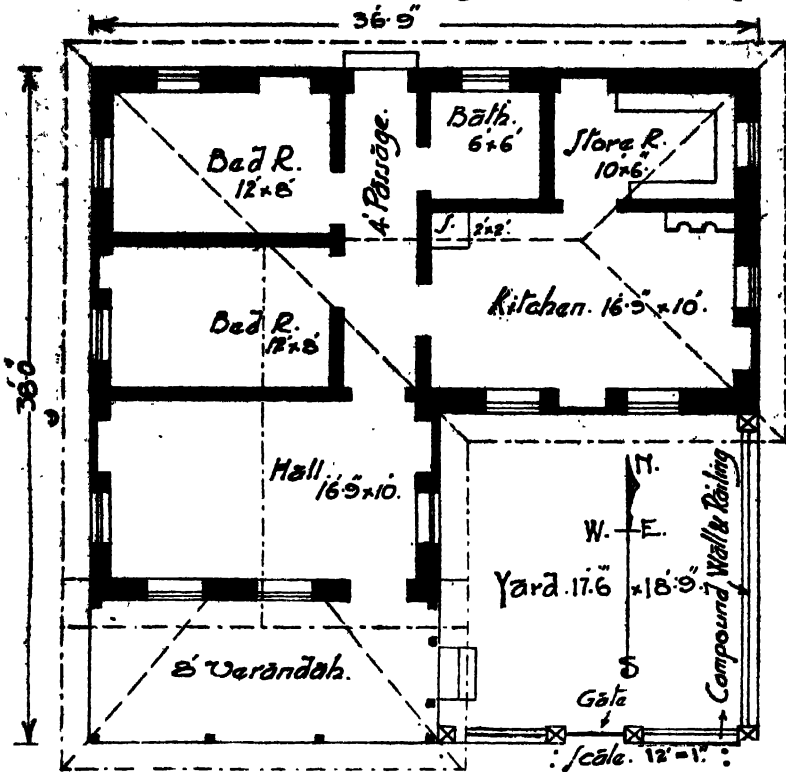
FIG. 33 & 34

in every respect. The left hand portion is projected a little beyond the verandah on the right hand side just for the sake of an artistic elevation. Similarly the verandah is made 4 ft. shorter for the sake of obtaining a beautiful effect in the elevation of the roof. The sizes of all the rooms are not bad for a typical small cottage like this. All outside walls are $1\frac{1}{2}$ brick thick and inner partitions either 9" or $4\frac{1}{2}$ " thick. The w.c. is of a cess pit type i.e. the solid and liquid

refuse is carried by water and allowed to deposit in a small chamber having an air-tight cover from which it is daily carted away. The w.c. is separated from the main building by a 3 ft passage as required by the Municipal Byelaws, Bombay. The roof is quite simple with only one valley gutter.

Plinth Area 1110] PLAN NO. 4 [Cost Rs. 4250

This is a convenient design of a small compact



: GROUND FLOOR PLAN. :

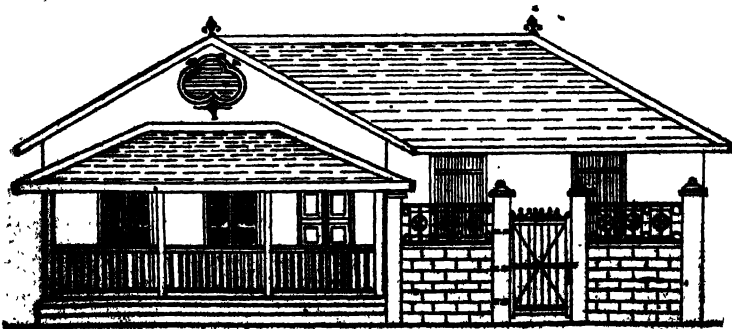


FIG. 35 & :

cottage. The main entrance is through a compound wall enclosing an open yard. There is a half closed verandah in the front, behind which there is a hall or a living room. The kitchen is a commodious one obviating the necessity of a separate dining room. There is a small store room attached to the kitchen. The two bed rooms, though rather small are quite independent, their privacy is maintained by the intermediate 4 ft. passage. There is a back entrance leading to a privy which is supposed to be built at a distance. The direction in which the cottage should face is shown by the North line. The small yard enclosed by a compound wall is a speciality of the design. The plinth area is 1110 sq. ft. and the cost is Rs. 4250. The living area is 698 sq. ft. which bears a proportion of 63 p. c. to the plinth area.

Plinth Area 1200] PLAN NO. 5 [Cost Rs. 3850

This is a plan of a building actually built. All

FRONT ELEVATION.



Scale 12'-1"

FIG. 37

the walls including the intermediate ones are of

stone in mud, the exposed surface only being cement-pointed. There is a spacious verandah in the front. The room on the right hand side called hall is better used as a bed room and the central one as a parlour. The front verandah, if made wider by a foot would serve a very good place for sleeping in the hot weather season. There is a

GROUND FLOOR.

Scale. 12'-1".

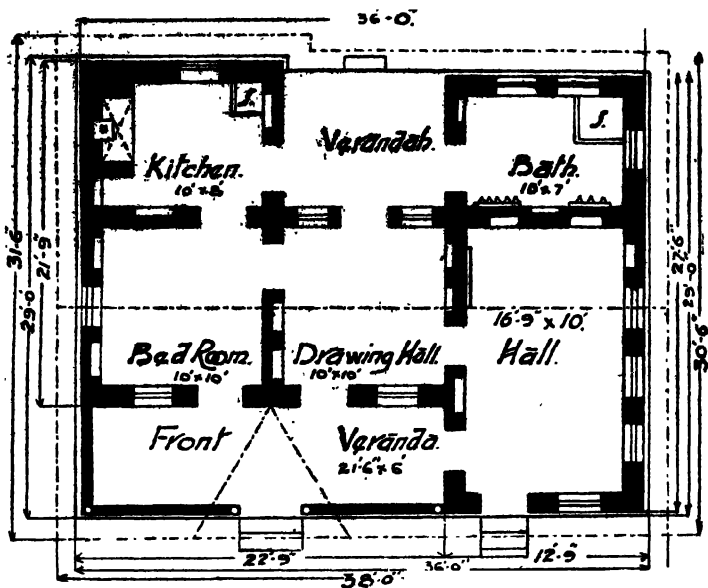


FIG. 38

smoke outlet provided in the kitchen. The rear verandah will serve for a dining room. The bath is sufficiently spacious. The roof is very simple involving no necessity of expensive trusses. The plinth area is approximately 1200 sq. ft. The living area is 728 and bears a proportion of 71 p.c. to it. The cost is 3850 Rs.

Plinth Area 1190] PLAN NO. 6 [Cost Rs. 5300

This is a plan typical of the buildings erected in the suburbs of Bombay, built by the Development Department. There are too many angles and projections not only on the outside front but also

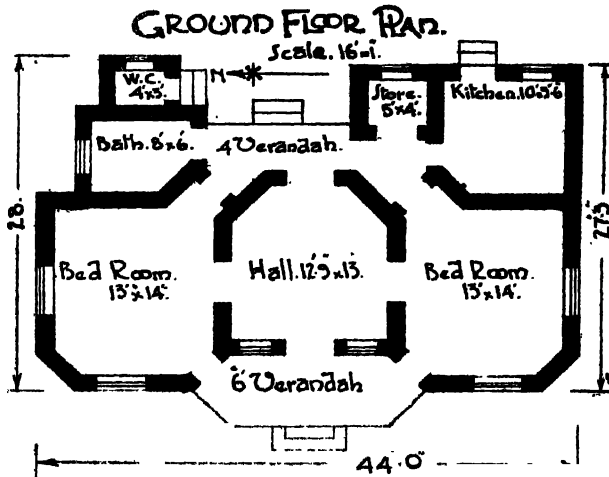


FIG. 39

FRONT ELEVATION.
Scale 16"=1'



FIG. 40

inside. Hence it is bound to cost more. The 6 ft. verandah in the front will serve as a very good sitting out place but as already mentioned in the

chapter grouping the central position of the drawing hall is sure to cause an inconvenience to an Indian family. There are two bed rooms of a very good size. The rear verandah is too small to serve as a dining place, for which there is no other room than the bed room near the kitchen. The kitchen, again is too small. The services are accessible independently from any bed room. This is one of the plans in which artistic beauty is sought to be obtained at a certain sacrifice of living space. The plinth area is about 1190 sq. ft. The living area is about 770 bearing a proportion of a little less than 65 p. c. to the plinth area. The cost is Rs. 5300.

Plinth Area 1337] PLAN NO. 7 [Cost Rs. 5270

This is another plan of a building suited to rural districts. There is a verandah 7'-6" wide in the front in which a light partition is erected to make a small office room. If the rear verandah is used as a place for dining there would be three bed rooms in addition to a kitchen and a drawing room. The small store room is situated at a convenient place with respect to the kitchen, in which a number of additional wall cupboards are provided. There is an open yard on the rear side which is enclosed by a compound wall. A latrine in one of the distant corners and a cow-shed with a loft for storing fodder on its top and a small space for storing firewood would make the arrangements complete. The room in the front, on the right hand side having a separate front entrance

would be very suitable to accommodate a guest. This house is actually built in rural area and has cost

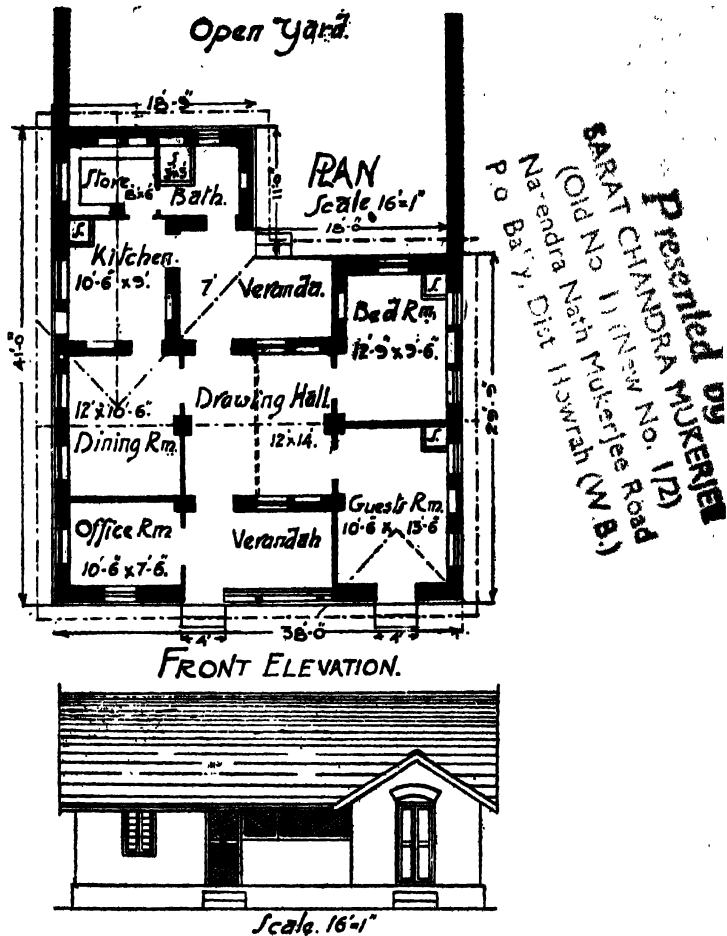


FIG. 41 and 42

Rs. 5270³ including the compound wall. Its plinth area is 1337 sq. ft. The living area is 1010 sq. ft. its proportion to P. A. is 75 p. c.

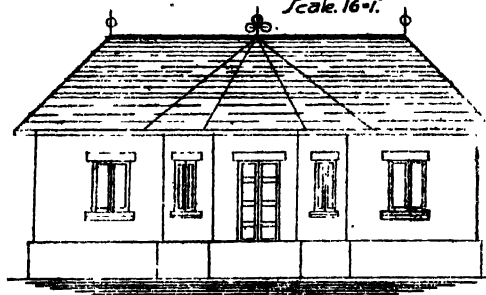
[Plot Area 1320] PLAN No. 8

[Cost Rs. 5780]

This is a cosy little cottage built in a plot of

FRONT ELEVATION.

Scale. 16'-1".



ground facing South in the Saraswat Colony Poona. It has been found by experience to be a very convenient and comfortable cottage. The bed rooms on the West get an ample breeze. All the rooms are elongated instead of being square. This has been found to be a great advantage; $9' \times 14'$ is a far better room from the point of utility than one of $11' \times 12'$, though the latter has a bit more superficial area. There is a small toilet or

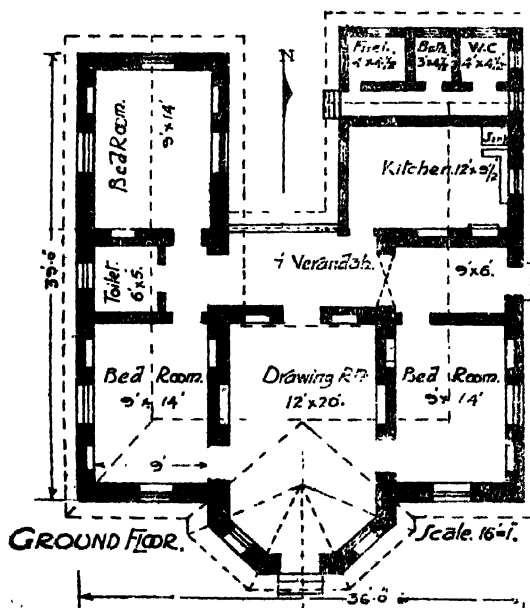


FIG. 43

FIG. 44

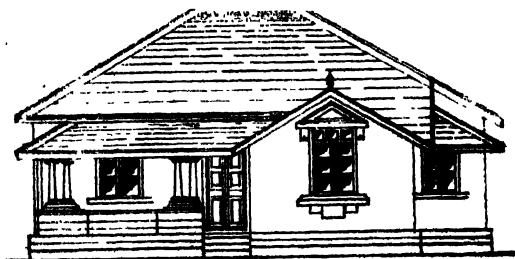
dressing room between the bed

rooms on the

West side. The room on the right hand side of the Drawing Room is a convenient one for a guest. The rear verandah serves the purpose of a dining room. When it is intended to add another floor the small vestibule $9' \times 6'$ in the centre on the right hand side is the proper place for locating a dog-legged (having two flights parallel to one another) staircase. The only disadvantage found in this design is that the open court-yard on the rear side is rather very much restricted in width, with the result that breeze does not play freely in that part. In consequence of this the walls heated by the sun do not quickly cool down. The cost of the building is Rs.5780.

Plinth Area 1300] PLAN NO. 9 [Cost Rs. 5050

This is one of the very convenient cottages. It is suitable for a North facing. In the front there is a verandah to serve as a waiting room or sitting out place. The kitchen, dining room and store room are very conveniently situated with respect to each other. The bed rooms are placed on the West side. The position of the bath room is excellent. There is a back exit which is so very

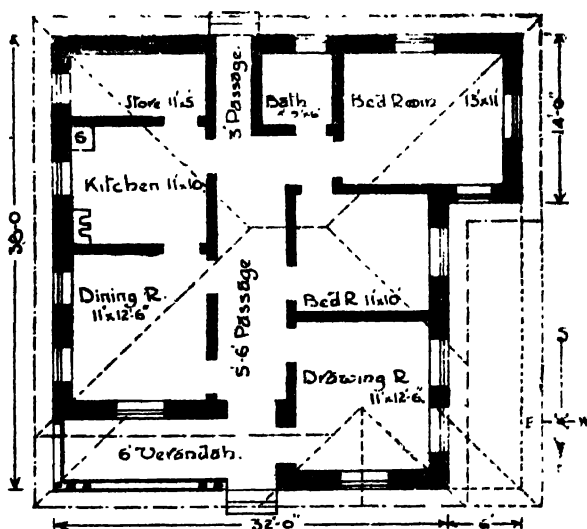


:FRONT ELEVATION:

FIG. 45

necessary in Indian homes. The dotted lines on the

right hand side show the position of a proposed verandah which, if constructed, will considerably add to the comfort. Instead of a regular verandah, if a wooden trellis work is constructed and a vine creeper trained on it, it would give the same comfort at a very cheap cost. The central passage, no doubt preserves the privacy of all the rooms, but if it were even 4 ft. wide, it would have equally well served the purpose and in addi-



°GROUND FLOOR PLAN°

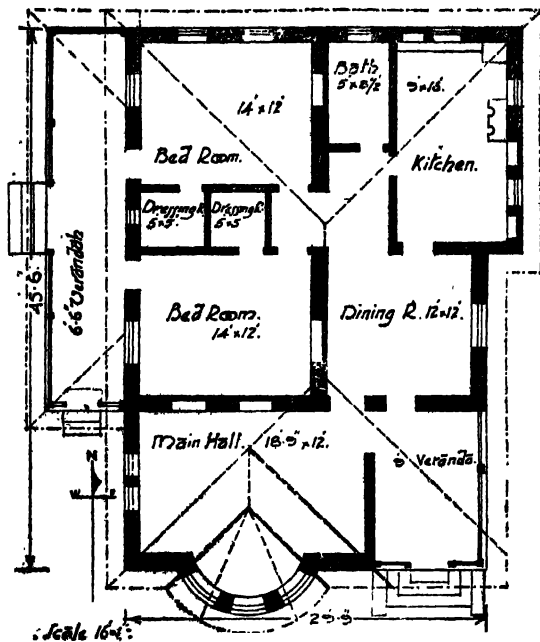
Scale 1/16" = 1'-0"

FIG. 46

tion increased the width of the rooms by 18 inches — A no small advantage in small cottages. The roof is very simple and yet attractive. The plinth area is 1300 sq. ft. and the cost Rs. 5650. On account of the central long and wide passage, the plan has lost its economic advantage. Thus the living area is 800 sq. ft. and is only 61 p. c. of the Plinth area.

Plinth Area 1475] PLAN NO. 10 [Cost Rs. 6600

This is a typical plan of a cottage designed



: GROUND FLOOR PLAN :

FIG. 47

especially to suit hot climate. It faces South, there is a verandah of 9 ft. width at the entrance which would serve as a waiting room. The kitchen and dining room being on the East would be flooded by the rays of the morning sun. The two bed rooms on the West side are further protected from the sun's heat by a verandah on that side. A special convenience of a small dressing room is made in each bed room. If bed rooms are separated by a partition wall they lose a certain amount of privacy as the partition wall is not sound proof. The device

adopted here viz, separating them by dressing rooms guarantees that privacy. The size of the kitchen is very good viz, $16' \times 9'$ and it is provided with a number of cupboards. The bath room, though only one in the whole house, is situated at a very convenient place. The door from the main hall to the dining room can, with advantage, be closed. The curved bay window in front of the



: FRONT ELEVATION :

FIG. 48

drawing room lends a peculiar charm to the elevation. The plinth area is 1475 sq. ft. and the carpet area 1121 which bears a proportion of 77 per cent to the former. The roof as shown by the dotted lines on the plan is very simple. The roof of the verandah on the West side is shown detached with hips at ends just for the sake of appearance. The cost of the cottage is Rs. 6600.

P.A. 1450 Sq. ft.] PLAN No. 11 [Cost Rs. 5100

This is another type of a small cottage designed on the old system of houses in villages with a central hall and closed verandahs on all sides. The

central portion of the front verandah is a little projected so that it provides an excellent sitting out place. This is a great improvement. Thin

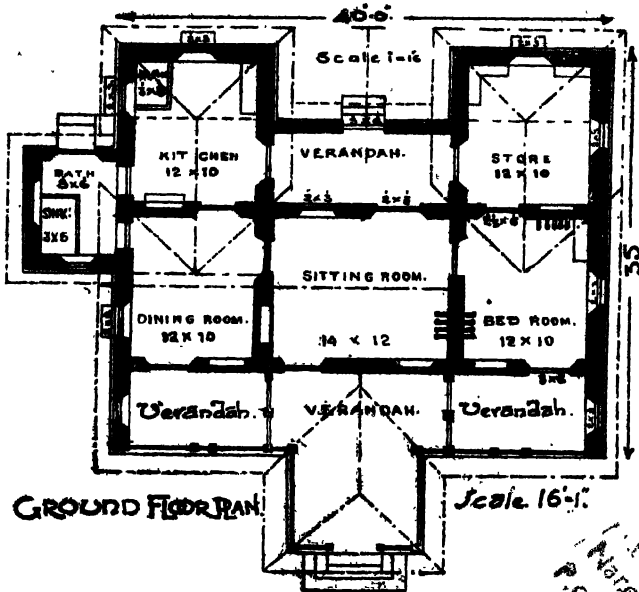


FIG. 49

FRONT ELEVATION
Scale 16'-1"

FIG. 50

wooden partitions across the verandah would make two small rooms for young boys and girls to study their lessons. The bath room is built outside with

entrances from the kitchen, dining room and also from outside. The rear verandah can very well be used for dining, in that case the dining room proper, can be used as a bed room. The store room is rather big, but for a life in rural country a big room is required for that purpose for storing staple food grains etc. The plinth area is 1410 Sq. ft. and the cost of the building which is actually built, is Rs. 5100. The living area is 1045 Sq. ft. and is 72 p. c. of the P. A.

Plinth Area 1520 Sq.ft.] PLAN No. 12 [Cost Rs.6800

This is a plan designed on the same lines as plan No. 8, page 124 but with slight improvements.



FRONT ELEVATION.

Scale 16-1

FIG. 51

In fact both these plans are built side by side in the Sarsawat Brahmin Colony, Poona. Note the semi-circular surface on the inside of the octagonal bay portion which is very good from a sanitary point of view. Angles present a lodging place to nests of vermin on which also dust deposits. A provision of a small store room has been made near the kitchen. The small back yard is paved with Shahabad slabs and in the centre is installed a

Tulshi plant so sacred to the Hindus. A bath, w.c. and a washing place are in a separate block detached from the kitchen by a blind wall and a 3 ft. passage beyond. The verandah behind the main

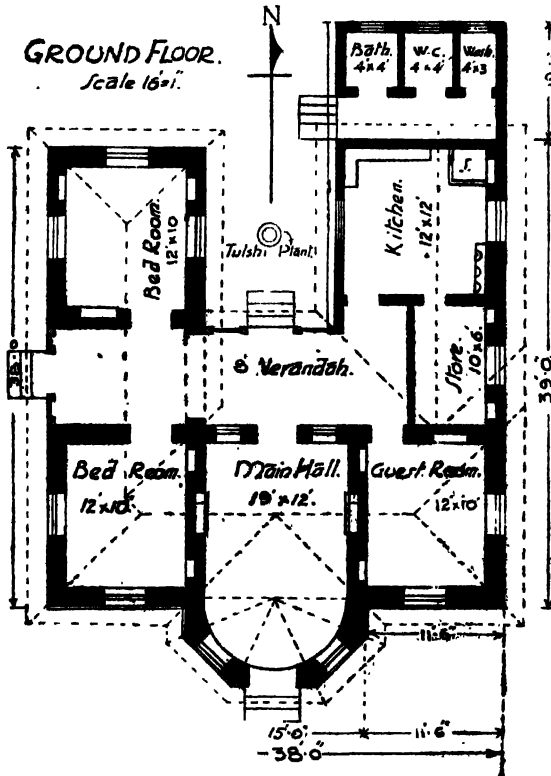


FIG. 52

hall would be useful as a place for dining. The only thing wanting is the omission of provision of a verandah either on the West or South side. The cottage has two facings one on the south and the other on the west side. The area of the main block is 1380 and that of the services 140 Sq. ft. and the cost is Rs. 6800.

Plinth Area 2139 Sq.ft.] PLAN No. 13 [Cost Rs. 6500

This plan illustrates the type of cottage built on the system of purely Hindu Architecture. Such buildings are met with even now in villages in

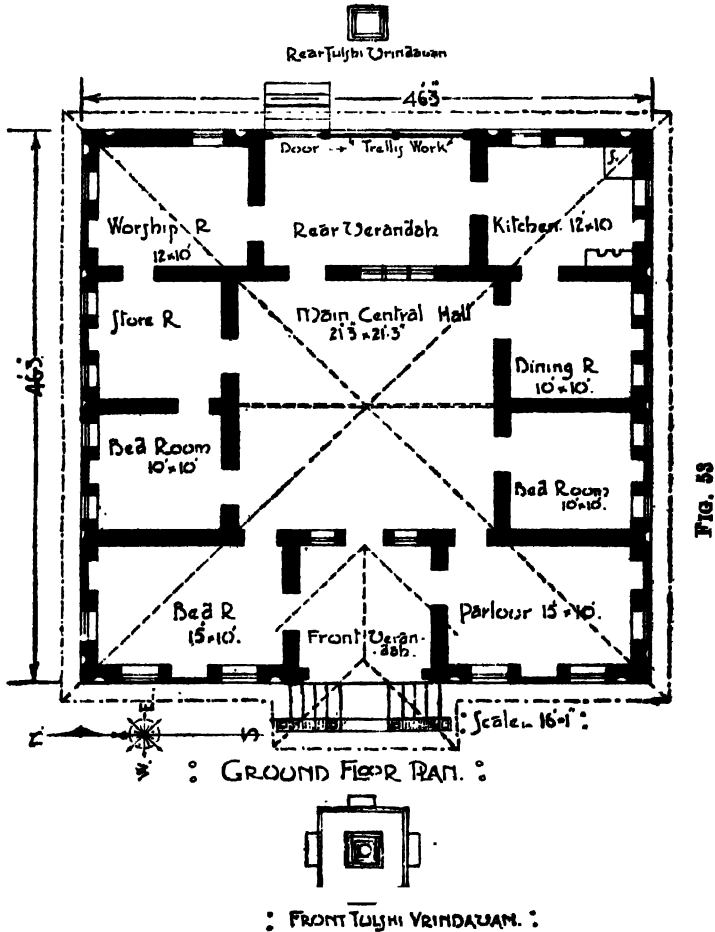


FIG. 54

the Konkan built by well-to-do people. The central room is comparatively a very big one. It derives all its light and ventilation through the doors and

windows in the front and rear verandahs and is therefore generally dark. In the houses of the richer people an open chowk (lounge) is kept in the centre of this room which sufficiently lights and ventilate this part. One of the rooms near the store or dining rooms is reserved as a sick room or a room for ladies in confinement. The approach steps to the main entrance are on both sides instead of in

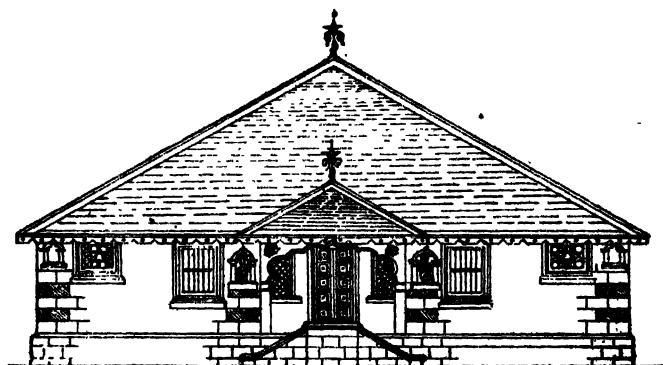
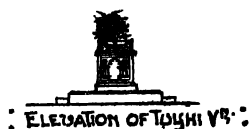


FIG. 55

: FRONT ELEVATION. :



: ELEVATION OF TULSHI VRAT. :

FIG. 56

the front. There is a Tulshi *Vrindavan* both in the front and the rear. The one on the front is also shown in plan and elevation in figs. 55 and 56. Fig. 54 shows the elevation of the building. The main door is a massive one mostly of *Umbar* tree which is very tough and offers the greatest resistance for an attempt to split it asunder with an axe. Ornamental thick brass washers are nailed on the horizontal and vertical rails of the panels and to enhance the decorative effect an arch is construct-

ad over it. On either side of the doors there are latticed windows, the fret work of which, allows but a dim light inside. Beyond these windows on the front side there are two images standing erect on either side indicative of *Dwar-pals* or Guardian Angels. The iron barred windows beyond these are the appendages of the present day which produce a jarring effect on the eye as they do not harmonise with the old architecture. Further towards the ends there are again old pattern carved windows and in the corner there are two niches in which on certain days of the month two lamps fed with sesamum or other oil are kept burning in the evening time.

Plinth Area 1550 Sq.ft.] PLAN No. 14 [Cost Rs.7000

This bungalow is actually built at Khar, a suburb of Bombay. It is a very economic and



‘FRONT ELEVATION’

FIG. 57

convenient design. The sizes of all the rooms are very good. The drawing room in the front could be better used as a bed room. If it is intended at some future date to raise another floor a stair case can be best placed in the store room. If the room on the right hand of the rear side called bath room in the plan is used as a kitchen and the small

room 6' and $4\frac{1}{2}'$ adjoining it is made a bath room the present kitchen could be very well used as a bed room. The w. c. arrangement is proposed to be made outside the main building in a detached block. Fig 57 shows an elevation which is simple and yet

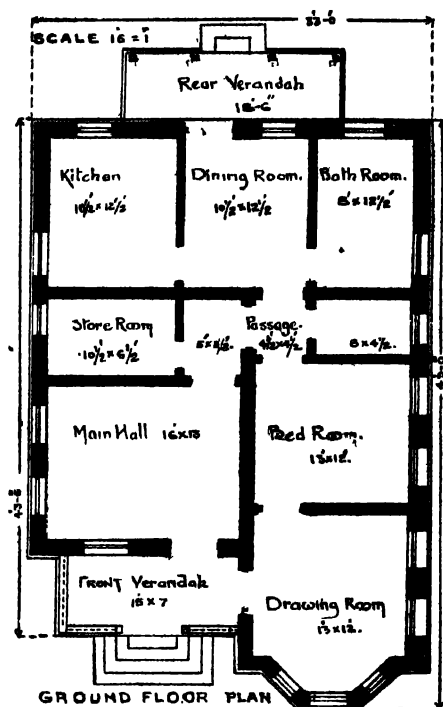
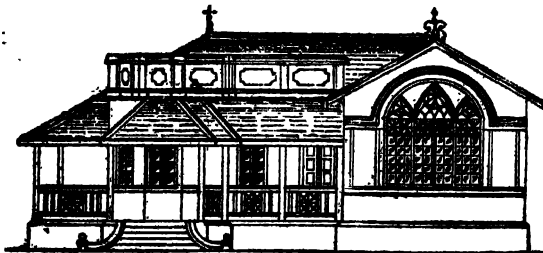
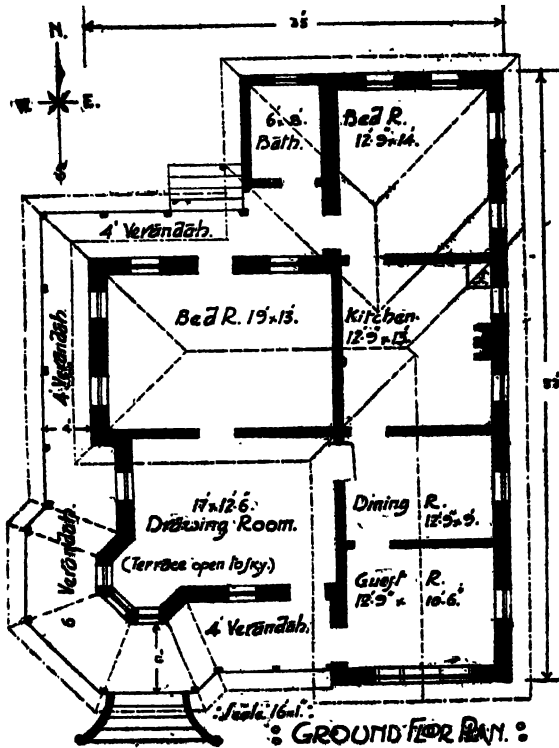


FIG. 58

artistic in appearance. Note that the front verandah is made about $21\frac{1}{2}$ ft. shorter in length and a hipped roof constructed on that side which makes the roof look elegant. The plinth area of the main building is 1450 Sq. ft. and that of the rear verandah 100 Sq. ft. and the cost is Rs. 7000. The living area is 1185 Sq. ft. which bears a proportion so high as 76 p. c. to the P. A.

Plinth Area 1825] PLAN No. 15 [Cost Rs. 9400

This small bungalow with an artistic elevation



FRONT ELEVATION.

Fig 60

was specially designed for a well-to-do gentleman

as his country residence in summer on a hill side. Verandahs on three sides are specially provided. The sizes of all the rooms are good. The building is facing the South. The bath room which is meant to be commonly used, is on the rear side having an independent entrance to it. The octagonal bay window in the front corner of the drawing room surrounded on the outside by a similarly shaped verandah is a special feature. The kitchen is on such a side as to cause the least nuisance of smoke and strong smells. The arrangement first suggested was to make the rear bed room a kitchen and the present kitchen was to serve as a dining room ; but subsequently provision for a guest room was required to be made, for which the present modifications were carried out. Built essentially for comfort the bungalow is not an economic one; the living area is only 1160 Sq. ft. and is 63 per cent of the P. A.; the cost is Rs. 9400.

Plinth Area 2120] PLAN No. 16 [Cost Rs. 10500

This is a bungalow suitable for a Western or Southern facing. A 7 ft. deep verandah protects

: FRONT ELEVATION :

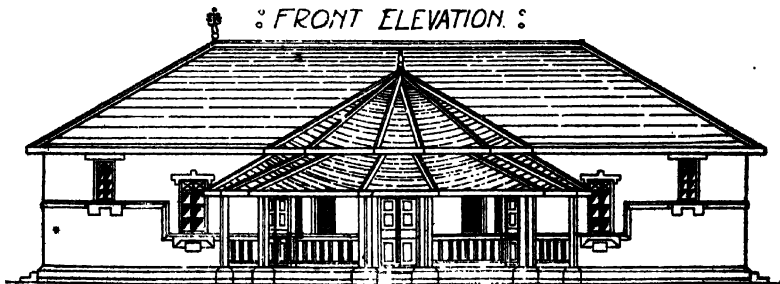


FIG 61

the central hall and two side rooms from the hot-

breeze. There are three decent sized bed rooms each provided with a separate bath room. The living room on the front can also be used as a bed room, in that event the small store room in front would serve as its bath room. The kitchen which is 22 ft. long and 8 ft. wide is a commodious one, and if a wooden partition is erected at the place shown

: GROUND FLOOR PLAN :

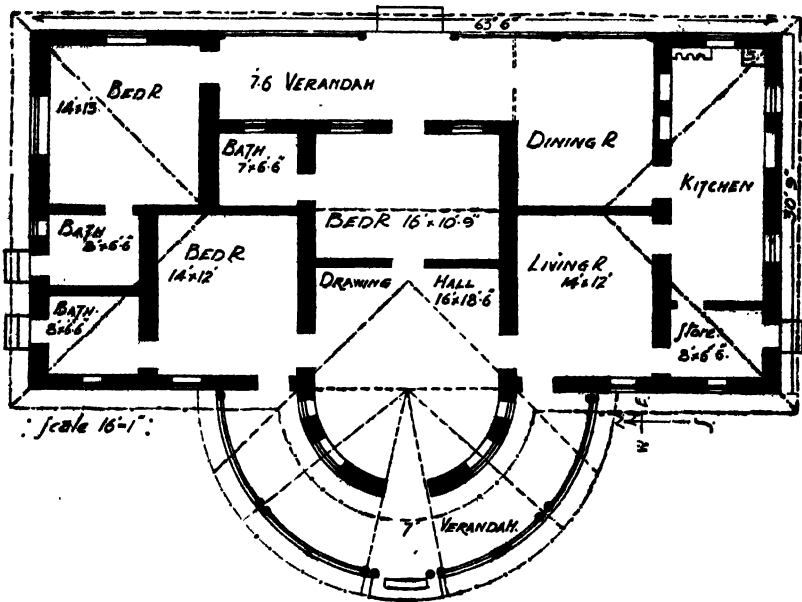


FIG. 62

dotted in the rear verandah, a spacious dining room of 16 ft x 12 ft is formed. The drawing hall of 18' 6" x 16' would be a luxury. The design is specially suited to families who have adopted European manner of living. It contains all the essential features of an Indian house and still it provides for conveniences required for European style of living

Plinth Area 1940] PLAN No. 17 [Cost Rs. 8000

This is a common design much in favour of many people particularly of the orthodox type who

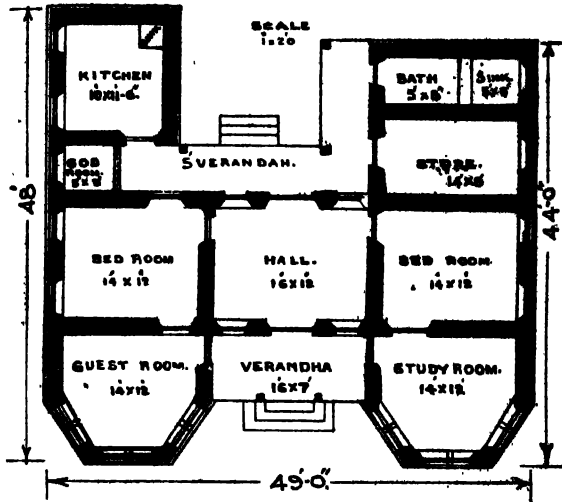
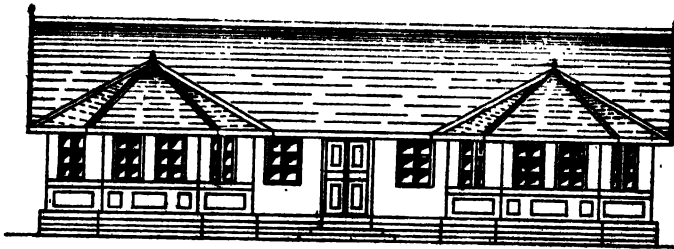


FIG. 63



FRONT ELEVATION
—Scale: 1/16"=1'—

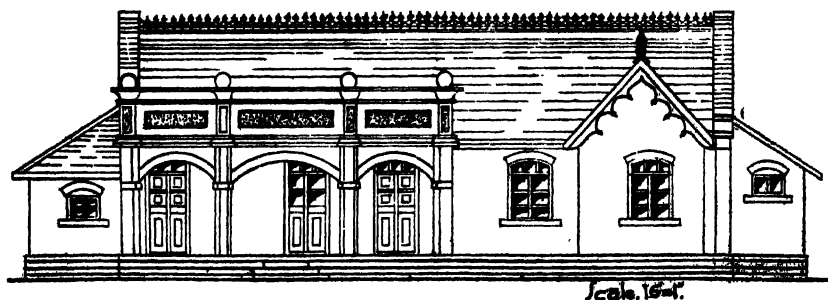
FIG. 64

find in it principles of old Hindu Architecture combined in a sweet mixture with the latest ideas about light and ventilation. The building is symmetrical on the front side. The sizes of all the rooms except perhaps that of the kitchen are very good. The rear verandah if closed with a trellis

would be useful as dining place. A small God room in a secluded corner is a special feature. If a loft is constructed on the top of the bath room the separate store room can be dispensed with and the room occupied as an additional bed room. The central hall would be a cool place to sit protected by verandahs on both sides. Though all the conveniences are sought for, the grouping of rooms is not made with particular attention to the direction of wind. Hence the design though much liked by people has not got a sterling value. The plinth area is about 1940 Sq. ft., the carpet area 70 per cent of that, and the cost Rs. 8000.

Plinth Area 2184] PLAN No. 18 [Cost Rs. 10150
Out-building 295] Cost Rs. 790

This plan correctly represents a building actually built, the actual elevation, however, is by no means impressive hence it is considerably modified here without altering the plan to the slightest extent. The kitchen block is cut off from the main building



FRONT ELEVATION.

FIG. 65

and joined to it by means of a covered passage. There is a nine ft. verandah in the front which

serves as a very good sitting-out place. There are two bed rooms of a decent size, one of them is very commodious viz. $25' \times 12' 6''$. Each bed room has a bath and dressing room and also a small verandah

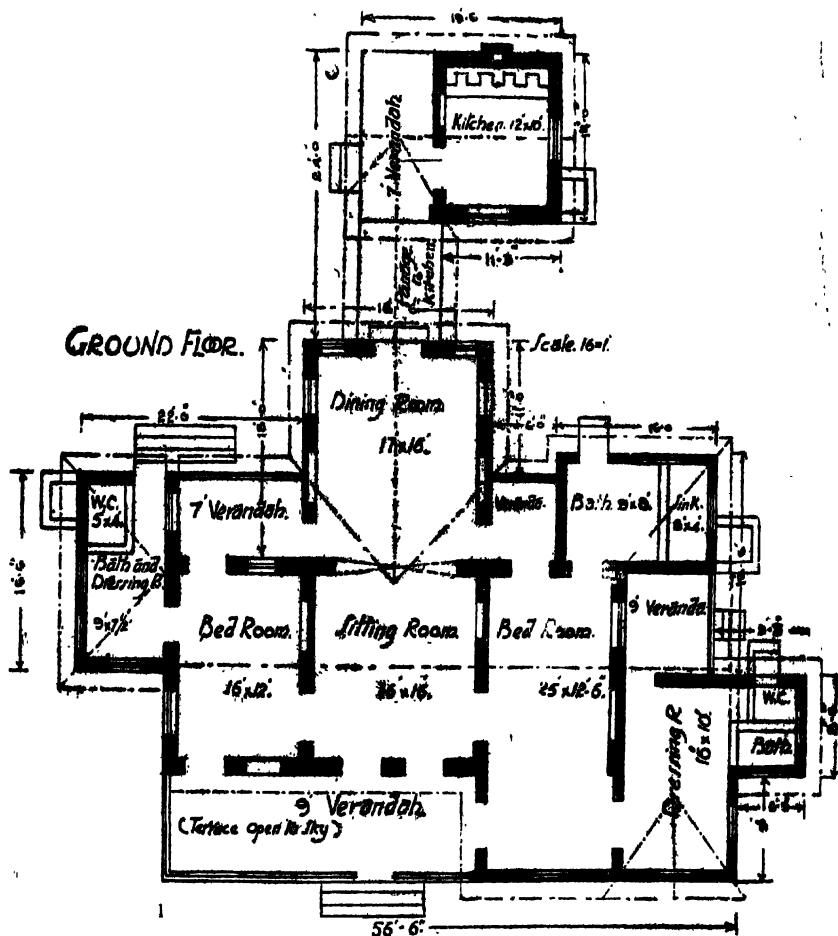


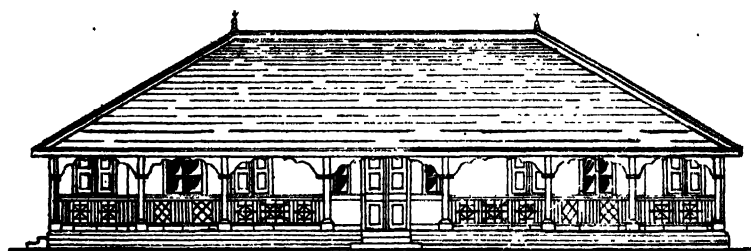
FIG. 66

attached to it. The dressing room in front to which also a bath room is attached can be utilised occasionally as an additional decent bed room. The

sitting and dining rooms in the centre are connected together by an arch, the arched opening being temporarily closed by a moveable screen. Thus these two rooms can be made into one spacious drawing hall on certain ceremonial occasions. By w. c. in each bath room is meant a commode arrangement. For this purpose each bath is accessible to sweepers from outside. The plinth area is 2480 Sq. ft. and the cost is Rs. 11000.

Plinth Area 2884] PLAN NO. 19 [Cost Rs. 13000

This plan is particularly suitable to the Indian manner of living. It is designed to face the west. There is a $6\frac{1}{2}$ ' ft. verandah on three sides in the front. A commodious drawing room $22' \times 14'$ is

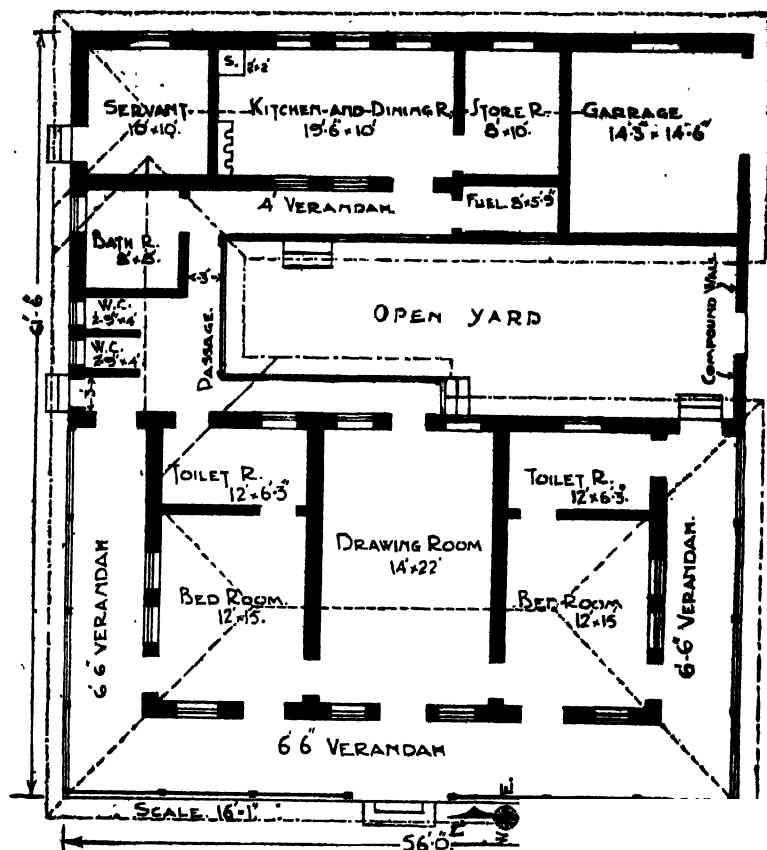


: FRONT ELEVATION :
: Scale-16'-1" :

FIG. 67

placed in the centre with two bed rooms $12' \times 15'$ on either side. A toilet room is attached to every bed-room. An open chowk separates the main building from the out houses in which a spacious room $10' \times 19' 6''$ provides both for a kitchen and a dining room. There are two w. c.s, a bathroom, a store and a fuel room. A servant's room separated by a blind wall, with an entrance from the outside

and a spacious garage make the cottage self-contained in every respect. The Plinth Area of the main building is 1736 and that of the out buildings 1148 Sq. ft. The total cost is Rs. 13000. If



: GROUND FLOOR PLAN :

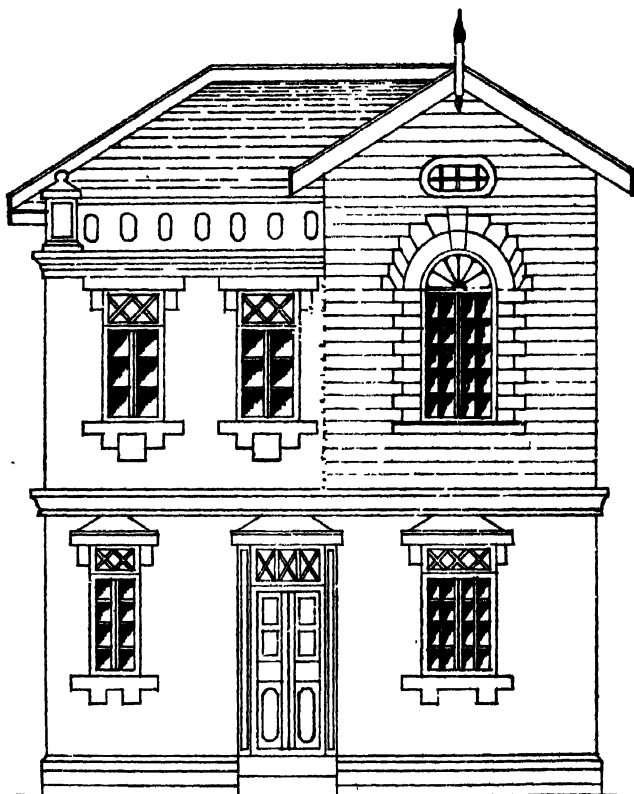
FIG. 68

site permits it is desirable to remove the out-houses a little further so as to increase the width of the open yard.

STORIED COTTAGES.

Floor Area 1148] PLAN NO. 20 [Cost Rs. 4530

This is a plan of a small compact building nearly square in shape. The front door opens into a living room. The latter is a good sized room for such a small cottage. On the left hand side of the entrance is placed a staircase. Behind the living

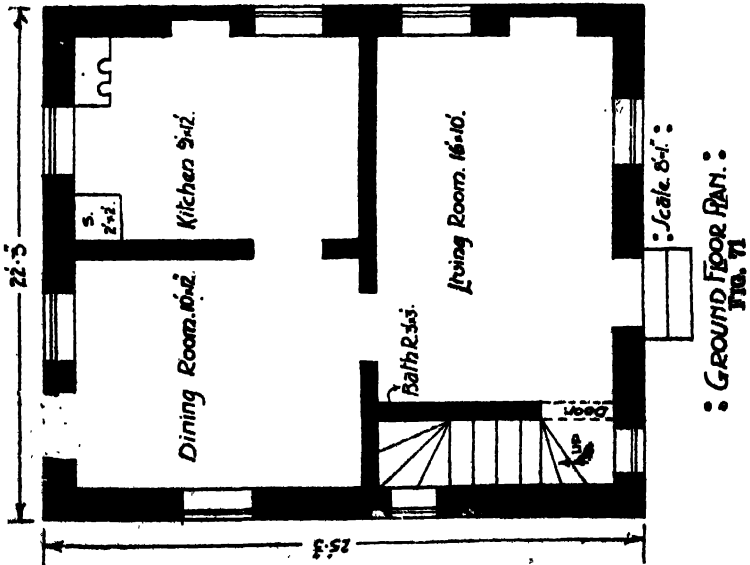
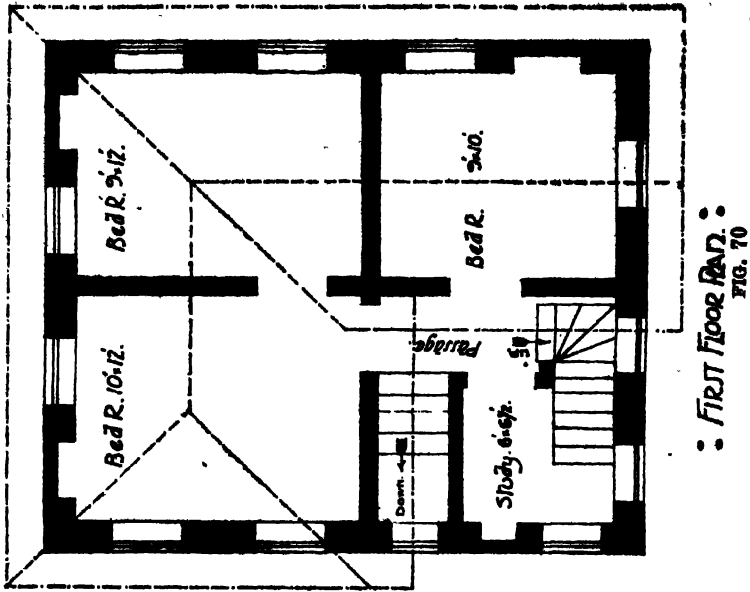


◡ FRONT ELEVATION. ◡

FIG. 69

room are situated the kitchen and dining room. Both of them are sufficiently big rooms. There is a back

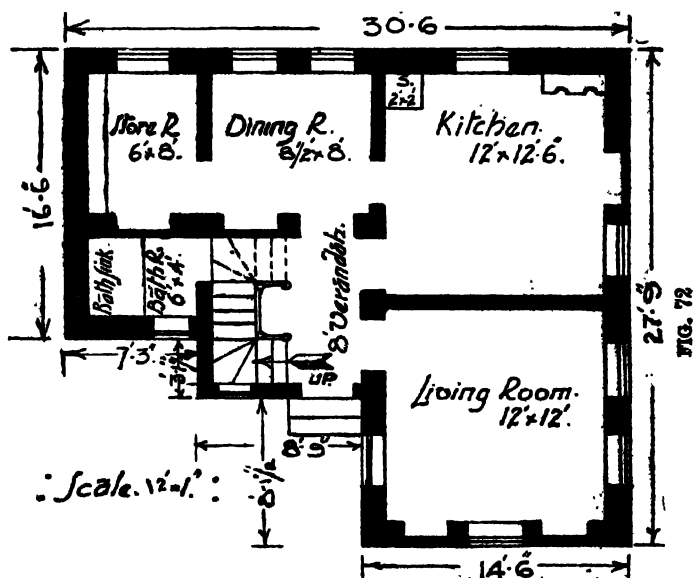
exit door from the dining room towards a privy



which will be somewhere on the rear side. A bath room has been provided underneath the flight of stairs. On the first floor, there are three bed rooms and a small room for young boys for study. The staircase adjoining the two front windows on the first floor is for going up to the terrace on the top of the study room. Behind the terrace an attic room has been provided, for which the walls have been raised to an extra height of 2ft. The Plinth area is 1148 and, the Living area 745 s. ft. which is 65 p. c. of the former. If the area of the attic room is taken into account the proportion would be much higher. The cost is 4530.

Floor Area 1190] PLAN NO. 21 [Cost Rs. 5000

This is a plan of a small compact cottage facing



: GROUND FLOOR PLAN :

South-west. Upon entering through the front door

one meets with the living room on the right hand side and on the left hand there is the entrance to the staircase. The kitchen which is a comparatively big room will partially compensate for the small size of the dining room. A store room of $6' \times 8'$ is placed near the dining room. The bath room is

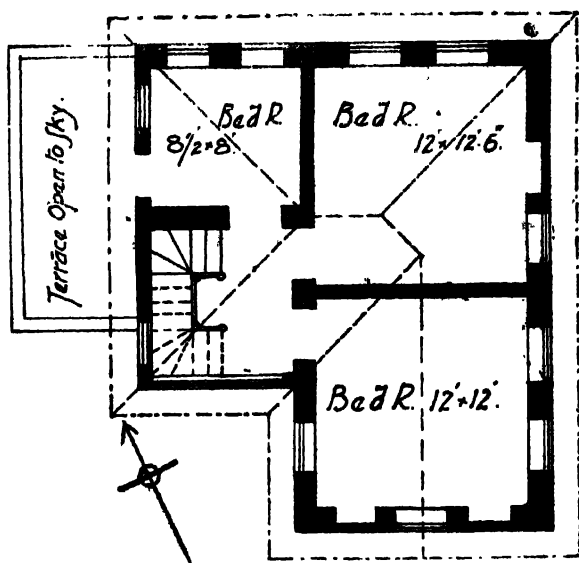


FIG. 73

beyond the staircase to which there is an entrance below its landing. There is no spare room either for ladies or the aged or invalid on the ground floor. On the first floor three bed-rooms are conveniently arranged. The Plinth area of the ground floor is 694 s. ft. and the total Floor area is 1187 s. ft.

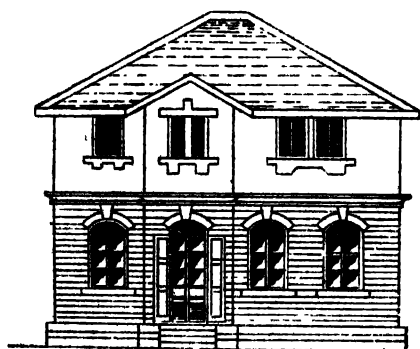
the cost should not exceed 5000 Rs. The living



area is 820 s. ft. and bears a ratio of nearly 70 % to F. A.

Floor Area 1420] PLAN NO. 22 [Cost Rs. 5540

This is a plan of a small square cottage. The rooms are few in number but their sizes are very good. On the ground floor there is a kitchen $8' \times 13'$. The living room adjoining it could be used as a dining room. The space below the flights of stairs could very well serve as a store room. On the first



FRONT ELEVATION.

Scale. $\frac{1}{16}" = 1'$.

FIG. 75

floor upon ascending the staircase all the three bed rooms are immediately accessible. There is also a dressing room of $12' \times 4'$ in a corner such that

it could be used by all in common. A successful

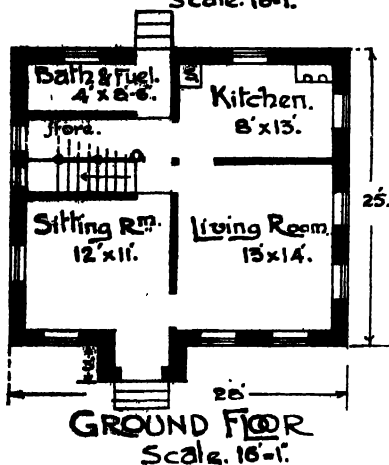
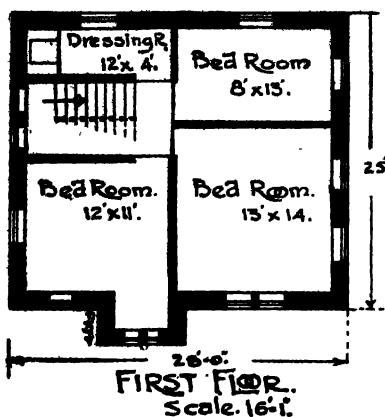


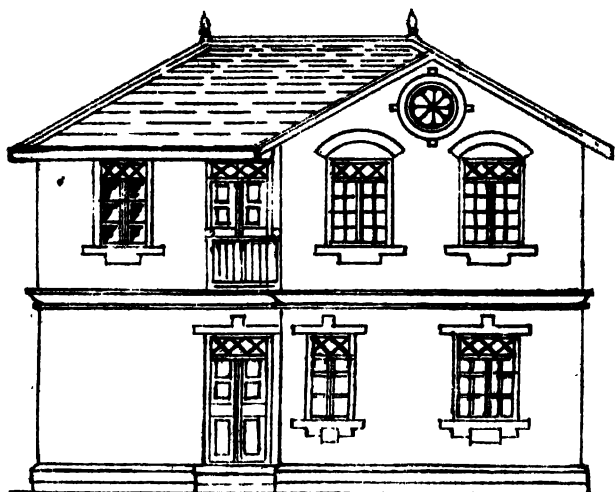
FIG. 76 & 77

attempt has been made in this design especially on the first floor to reduce to a minimum the space usually lost in lobbies. The outer walls are of stone in lime $1\frac{1}{2}$ ft. thick to afford protection from heat and give safety from thieves and all the internal ones are $\frac{1}{2}$ brick thick i. e. 6 inches including plaster on both sides with intermediate timber posts to support the superincumbent weight of floor. The cost of the cottage is Rs. 5540. The Carpet area is 984 s. ft. which is 69 % of the Floor area.

Floor Area 1324] PLAN NO. 23 [Cost Rs. 5500

This is another very compact plan of a small building. There is a small lobby in front of the entrance which opens into a living room. A part of the living room can be turned into a small study room by putting a screen below the arched

opening. The size of the kitchen is good viz $14' \times 10'$



78

FRONT ELEVATION.

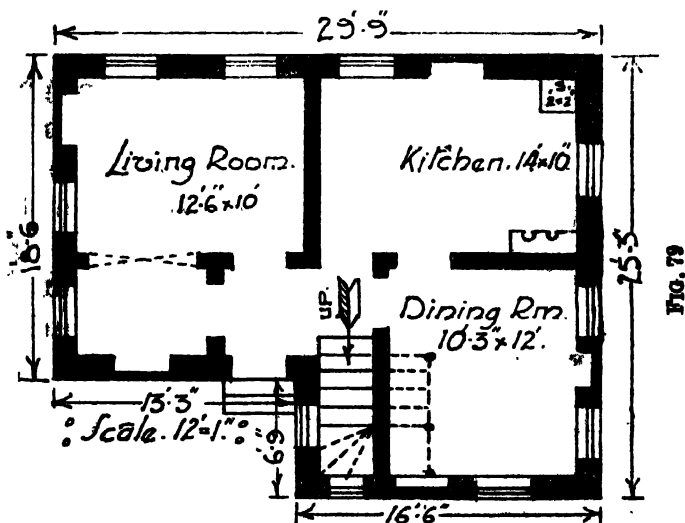


FIG. 79

° GROUND FLOOR PLAN. °

The dining room is commodious. The staircase is

situated at a very convenient place. Upstairs there are three bed rooms and a toilet room. Two of the bed rooms are spacious enough. The elevation too, shown in fig. 78 is graceful. A number of wall

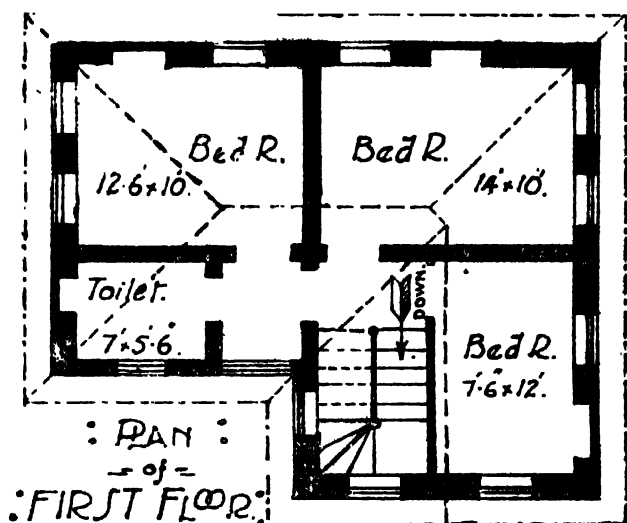


FIG. 80

cupboards have been provided. The living area is 860 s. ft. which bears a proportion of 65% to the Floor area which is 1324 sq. ft.

Floor Area 1352] PLAN No. 24 [Cost Rs. 5630

This is one of very economic designs of a small cosy cottage. All the outer walls are of stone in mortar $1\frac{1}{2}$ ft thick and the inner ones are made of brick nogging, that is, vertical posts at 5 to 6 ft. intervals joined together by horizontal timbers, the intermediate space being filled with brick work in lime $4\frac{1}{2}$ inches thick. On the ground floor there is a sitting room in the front, and a kitchen and a dining room on the rear. A bath room attached on

the left hand side is accessible from the outside also. The staircase is an easy one with no winders.

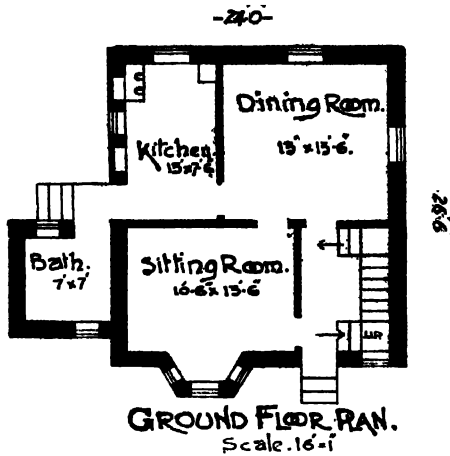


FIG. 81

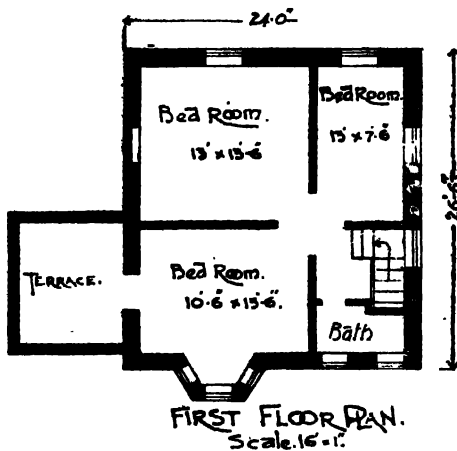
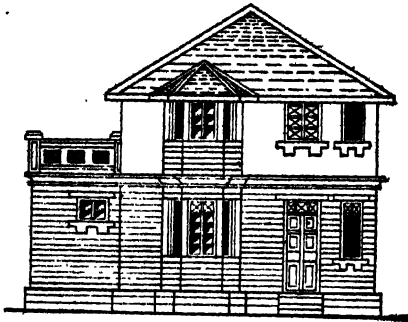


FIG. 82

An attempt has been made on the first floor to save space in lobbies by arranging all the doors at one place. But from the point of view of privacy it is not a desirable thing. Because if the doors happen

to be open, one standing in the centre gets full view



FRONT ELEVATION:

Scale, 16'-"

FIG. 83

of the inside. There is also a bath room on the first floor independently approachable from any bed room. The bay windows are just for lending an expression of beauty to the elevation.

The Floor area is 1352 sq. ft. and the Carpet area

907 sq. ft. bearing a proportion of 67% to the former. The cost is 5631 Rs. The abstract of cost is given below:—

	Rs.
Excavation for foundations	11
Filling concrete	175
Masonry in founds	84
do in plinth	148
Superstructure of outer walls	1355
do of partitions	390
Doors	522
Windows	566
Flooring	400
Paving	275
Roof	720
Plastering, white and colour-washing	520
Pointing on outside	115
Staircase	150
Finishing—(Oiling wood-work, sink, shelves, pegs, loft etc)	200

5631

Floor Area 1489] PLAN NO. 25 [Cost Rs. 5600

This smart little cottage is a convenient one.

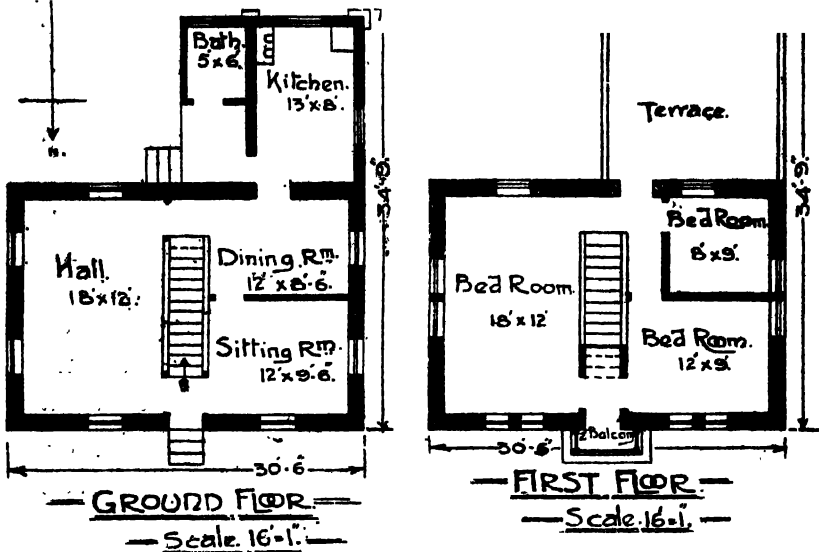


FIG. 84 and 85

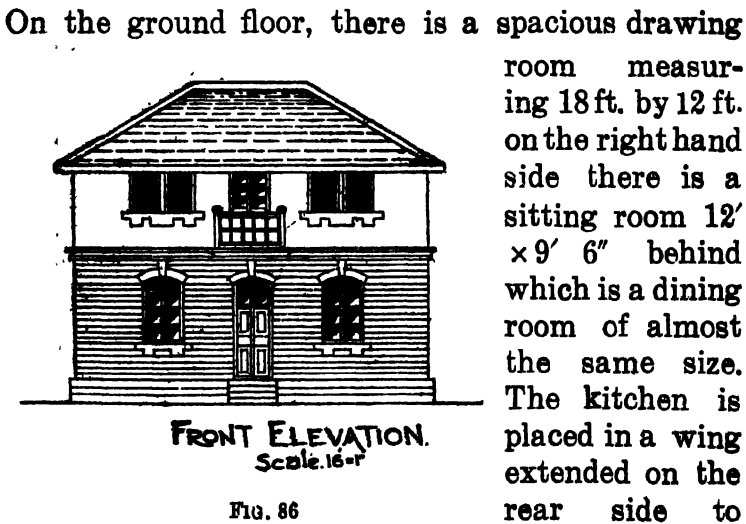


FIG. 86

On the ground floor, there is a spacious drawing room measuring 18 ft. by 12 ft. on the right hand side there is a sitting room 12' x 9' 6" behind which is a dining room of almost the same size. The kitchen is placed in a wing extended on the rear side to which is attached a small bath-room in the

verandah. The space below the staircase can be used as a store. On the first floor there are three bed rooms and a terrace, the latter is accessible from any of the bed rooms. The plan is suitable for a North facing. The plinth area is 848 sq. ft. and the total Floor area is 1489 sq. ft. The cost of the cottage is 5600 Rs. If half the terrace area is included in the Carpet area the latter is 1030 sq. ft. and is 70 per cent of the F. A.

Floor Area 1710] PLAN NO. 26 [Cost Rs. 6500

This is another very conveniently designed small cottage suitable for a facing of North or West. There is a seven ft. verandah in the front which

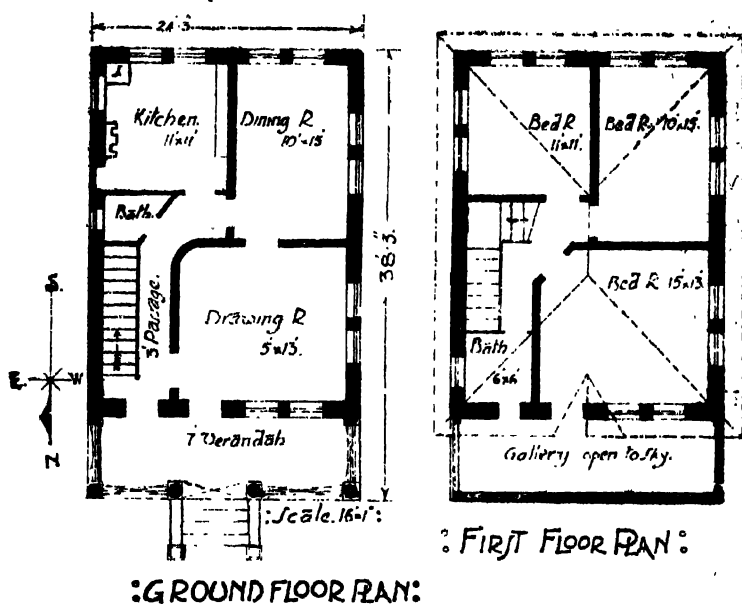
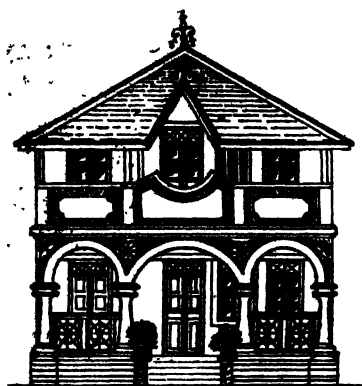


FIG. 87 and 88

opens into a drawing room 15 ft. by 13 ft. The staircase has an independent opening either from inside

or from the outer verandah. A small bath room is



; FRONT ELEVATION.:

FIG. 89

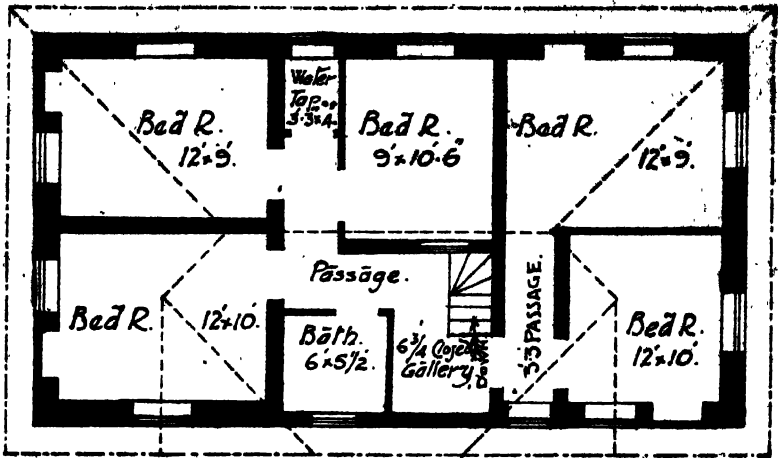
arranged below the landing of the staircase and is independently accessible from any room. The kitchen will be in the N.E. or S.E. corner according as the cottage faces the West or North respectively getting the benefit of the morning sun. The dining room has got a decent size viz. 10 ft. by 13 ft. On the first floor

the three bed rooms are all of good sizes with separate entrance to each; there is in addition a bath 6' x 6' common to all and a 7 ft. gallery on the top of the front verandah independently accessible from all bed rooms. The roof is a very simple one. The building has got a smart and attractive elevation as shown in fig. 89. The Floor area of the cottage is 1710 sq. ft. and the cost is 6500 Rs. The Carpet area is 1130 and bears a ratio of 66 per cent to the F. A.

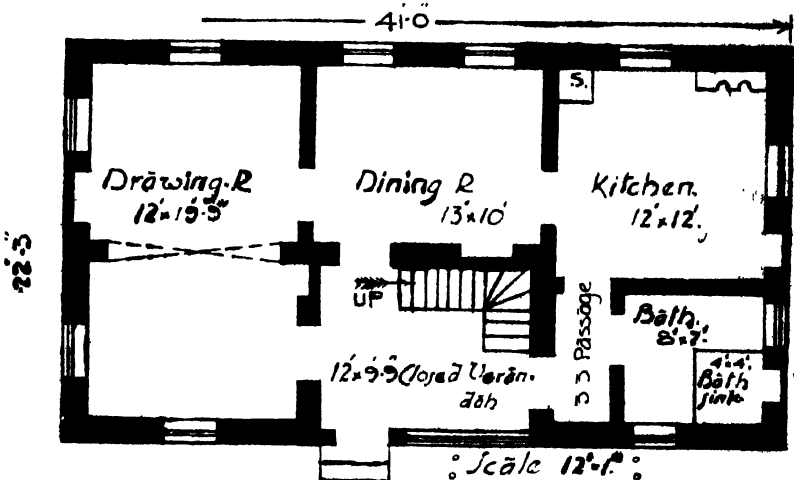
Floor Area 1824] PLAN NO. 27 [Cost Rs. 7000

This is a plan suitable for an oblong plot of land with a wide front. The front entrance opens into a small verandah on the left hand side of which there is a commodious drawing room. A temporary partition placed across the latter below the arch would make two small rooms if necessary. The kitchen and dining room are both spacious and

the bath which is a good sized room is further



° FIRST FLOOR PLAN.



° GROUND FLOOR PLAN. °

FIG. 90 and 91

detached by a lobby. The staircase is very conveniently placed. Upstairs are arranged, 5 decent bed rooms quite independent of each other. Thus

the plan provides for all that is desired in a small cottage with the greatest economy of space. However, a back exit from the dining room or a side exit from the kitchen would further add to the convenience.



: FRONT ELEVATION. :

FIG. 92

nience. The elevation which is shown in fig. 92 is equally attractive. The Floor area is 1824 sq. ft. Living area 1256 bearing a proportion of 69% to the former and the cost is 7000/ Rs.

Floor Area 1920] PLAN No. 28 [Cost Rs. 7200

This is a small cottage suitable for a North facing. The staircase is placed just in front of the entrance to the living room which could be screened from the people going up by means of a removable cloth curtain. On the ground floor there is a kitchen which is rather small, a spacious dining room, and a decent sized bed room,

which would serve as a female apartment or a (W.B.)

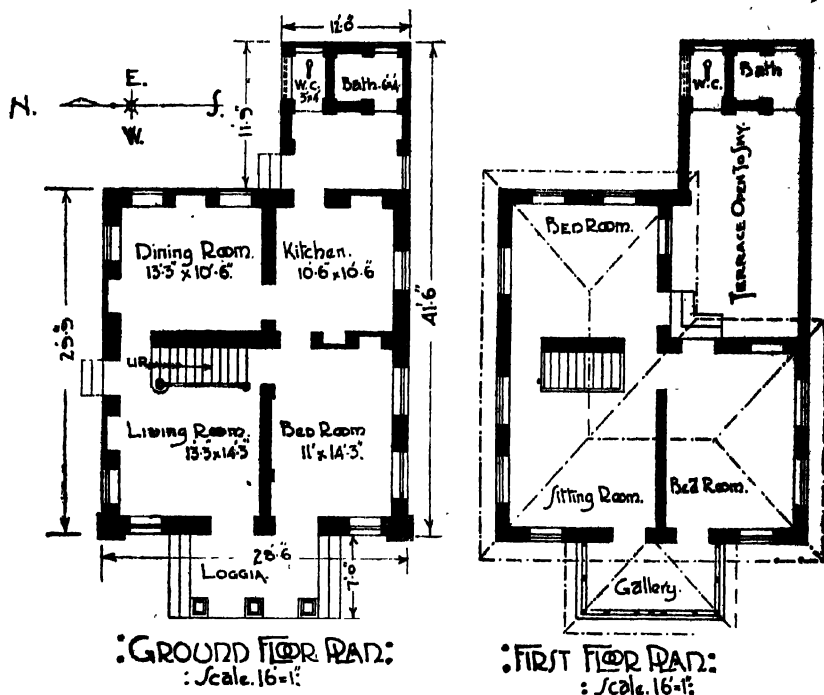


FIG. 93 and 94

Comfort Room. The bath and w.c. block is separated from the main building by means of a 6 ft. passage. The entrance to the w. c. could, with advantage, be screened from sight from the kitchen. An open loggia (verandah) is provided on the West which would make the living and bed rooms on the ground floor comfortable. On the first floor the arrangement is the same as below except that a terrace is constructed on the top of the kitchen and the lobby beyond. It is possible to provide two commodious wardrobes on the upper floor in the space above the beginning of ascent of the staircase, opening in both the bed rooms, with a common

back for both (wardrobe is not shown in plan). A covered gallery is provided on the top of the verandah below on the west side. The total Floor area of the cottage is 1920 sq. ft. the Carpet area

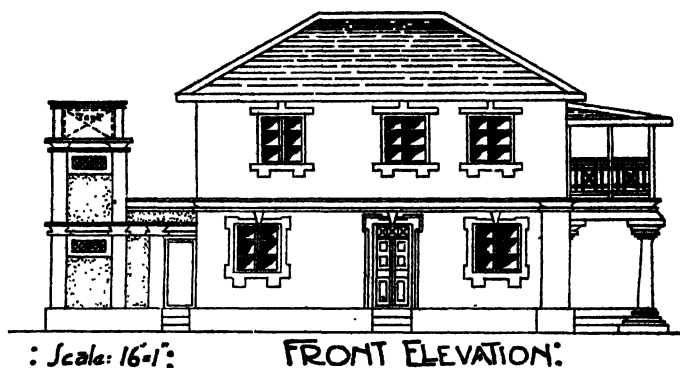


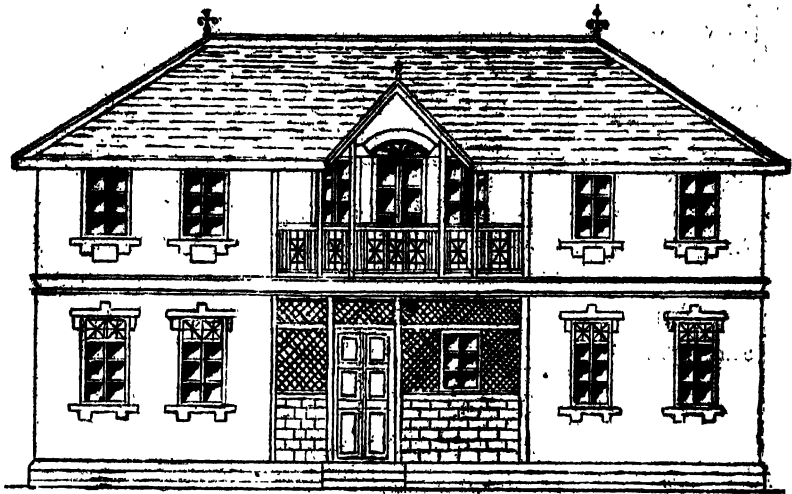
FIG 95

is 1348 sq. ft. including half the area of the terrace above. The proportion of Carpet area to Floor area is 70 per cent. The cost is Rs. 7200. Fig. 59 shows the North elevation.

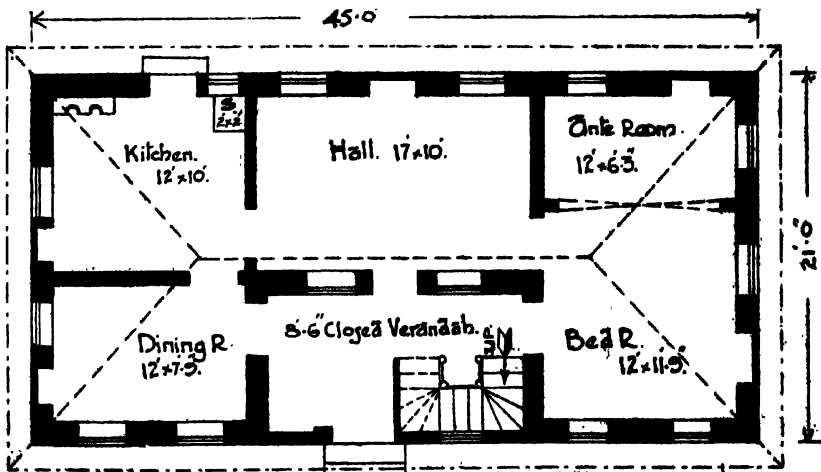
Floor Area 1890] PLAN No. 29 [Cost Rs. 7300

This plan of a cottage is suitable for a plot which has a wide frontage but a small depth. In the front there is a closed verandah to serve as an entrance hall in which a staircase is arranged on one side which occupies a minimum space. The kitchen and dining room occupy the left hand side; there is an exit door in the kitchen on the rear side. The drawing hall is comparatively a spacious room but is close to the kitchen. It is, therefore, advisable to devote the hall to use as a female apartment and the room on the right hand side 12' x 18' ft. as a spacious drawing room. As the

staircase has an entrance in the front verandah,



: FRONT ELEVATION. :



: Scale. 12" = 1' :

GROUND FLOOR PLAN. :

FIG. 96 and 97

one of the rooms upstairs could also be conveniently used as a drawing room. There is no bath provided inside the building on the ground floor. It must be built in a detached position somewhere outside. The total Floor area is 1890 s. ft. and the cost is Rs. 7300. The Living or Carpet area is 1420 sq. ft. which is 75 p. c. of the F. A.

Floor Area 1680] PLAN No. 30 [Cost Rs. 6900

This little cottage is an example of how a small building if designed well can accommodate

GROUND FLOOR.

Scale 12-1".

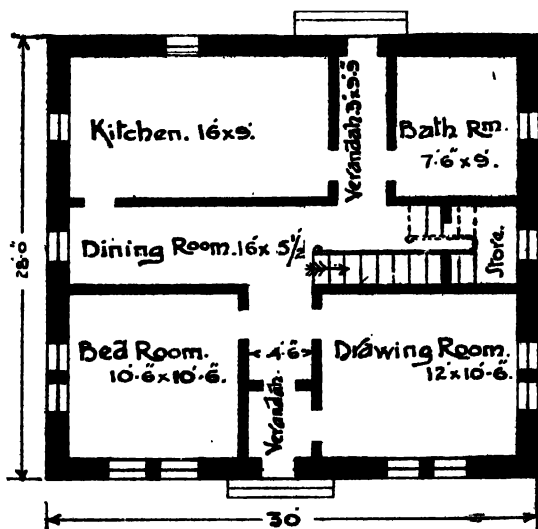


FIG. 98

very conveniently 10 or 12 members of a family. Even the narrowest space is well utilised therein. The entrance to drawing room is through the small

vestibule just in front of the main entrance in which a door is placed to screen the whole interior part

FIRST FLOOR.

Scale. 12'-1".

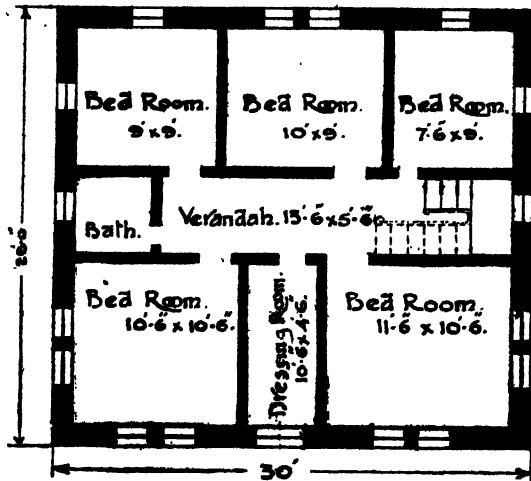
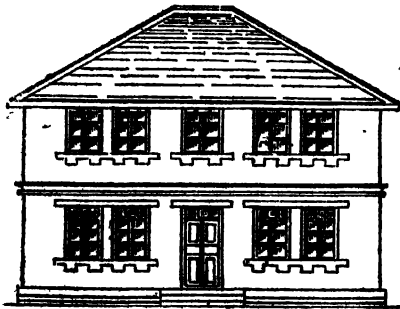


FIG. 99

from the outsiders' gaze. The size of the kitchen viz. 16' x 9' is so good that ordinarily there should



—FRONT ELEVATION—

—Scale. 16'-1"—

FIG. 100

be no necessity of a separate dining room. If, however, one is occasionally required, the space near the kitchen can be very usefully occupied for that purpose; the bath room on the ground floor is independently approachable from every room and is of a decent size; and there is a back exit

provided near it. The space below staircase landing can be used as a store room. There is a bed room on the ground floor which can ordinarily be used as a ladies' apartment. When necessary it can be turned into a Comfort Room which, with an East aspect, should prove an ideal one for the purpose. The direct entrance indicated from the kitchen to bath room may or may not be provided.

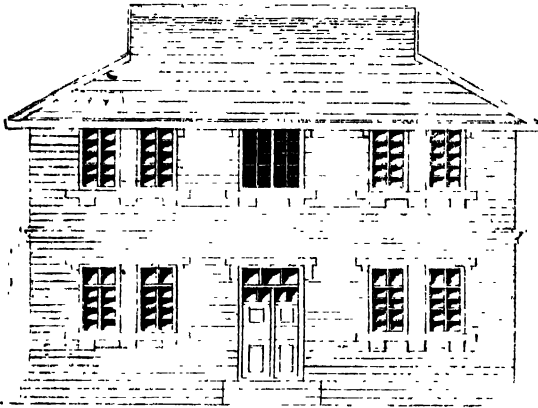


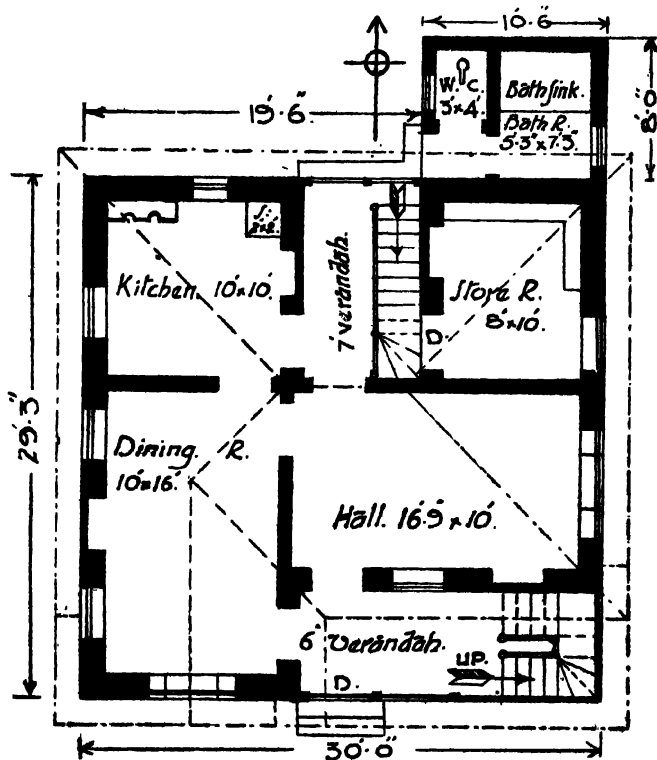
FIG. 101

The staircase is a very easy one with no winders and on the first floor five bed rooms, a dressing room and a bath are accommodated. It is not difficult to light the passage in front of the staircase landing on the first floor from windows at both ends, if necessary, however, a sky light in the form of a glass tile at top in the roof should be provided in addition. The only bad feature of the design is that the sizes of all the rooms except kitchen and bath are small. Figs. 100 and 101 show two slightly different elevations; the former is drawn to a smaller scale. The Floor area is 1680

and the Carpet area which is 1080 sq. ft. bears a proportion of 66 per cent to it; the cost of the building is Rs. 6900.

Floor Area 1924] PLAN No. 31 [Cost Rs. 7250

This is another compact plan of a small cottage facing the South. The main staircase is in the



⋮ GROUND & 1ST FLOOR PLAN. ⋮

⋮ Scale. 12"=1' ⋮

FIG. 102

front verandah on one side where it occupies the least space and the subsidiary one on the rear side which is absolutely a private one. There are

kitchen, store, dining and a drawing room on the ground floor and four bed rooms on the first floor. The arrangement of the w. c. first and bath afterwards is likely to be found fault with by ladies. For this purpose it is advisable to make one big bath room out of the two and build a w. c. some where outside in a detached position or make it face the West separated from the bath room passage

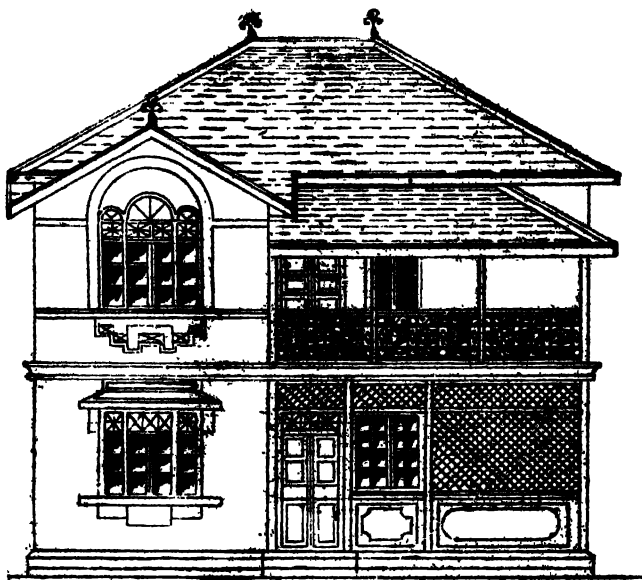


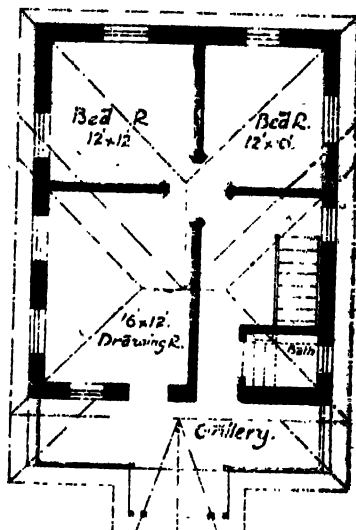
FIG. 103

° FRONT ELEVATION. °

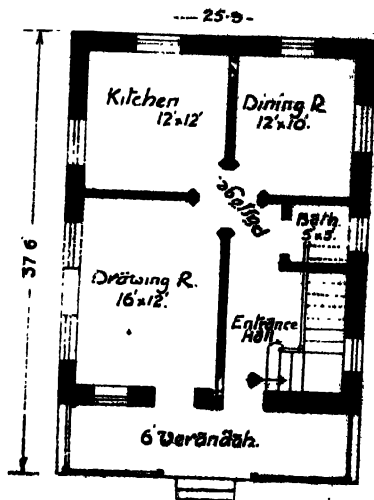
by a blind wall. If the space below the rear staircase is included in the store room the latter would be even more spacious and be used even as a bed room. The grouping of the rooms is best suited to Indian style of living ; the design is therefore likely to be very much appreciated. The Floor area of the cottage is 1924 sq. ft. and the cost of both the floors Rs. 7250.

Floor Area 1970] PLAN No. 32 [Cost Rs. 7800

This is a rectangular little cottage suitable for



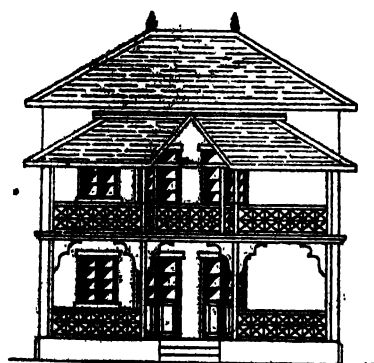
: FIRST FLOOR PLAN :



GROUND FLOOR PLAN :

FIG. 104 and 105

an elongated plot with a narrow front. The ground



: FRONT ELEVATION :

FIG. 106

There is no back door on the rear side nor is there

floor consists of a verandah, kitchen, dining, and a drawing room with an independent staircase. The positions of all the four doors which are concentrated at one place though economise the space, yet do not form a happy arrangement from the point of view of privacy.

any spare room on the ground floor to serve either as a ladies' apartment or a Comfort Room. The elevation shown in fig. 106 looks rather queer though graceful. The Floor and Carpet areas are 1970 and 1210 respectively the latter being 62 per cent of the former. The cost is about Rs. 7800.

Floor Area 1940] PLAN No. 33 [Cost 7800

This cottage provides for a small verandah on the front and the rear and a kitchen, dining,

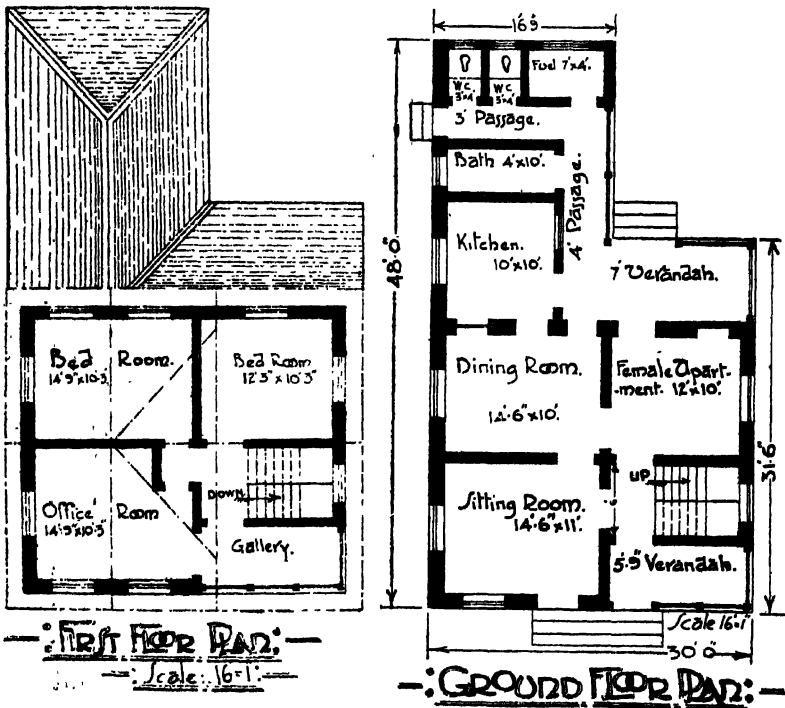


FIG. 107 and 108

sitting rooms and a female apartment on the ground floor and three bed rooms on the first floor.

The staircase is placed in a convenient position, so that it can be kept open to an outsider without disturbing the privacy of other rooms. The front sitting room can be better used as an office room so that on the first floor there would be a strict privacy for all the bed rooms. The w.c.s are separated by a 3 ft. passage. It is



: FRONT ELEVATION:

: Scale: 1/16\"

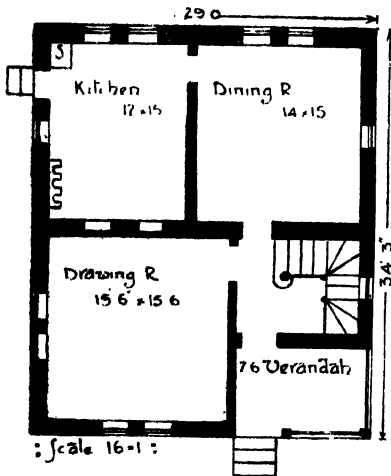
FIG 109

possible to use the rear verandah for dining purposes so that the dining room can be availed of as an additional spare room. A cupboard on both sides of a wall with a thin partition of Shahabad or Katni slab one inch thick laid with its face vertical is provided in the wall between the kitchen and the dining room. The total Floor area is 1924 sq. ft. and the Carpet area 1233, which is 64% of it. The cost is 7800 Rs.

Floor Area 1986] PLAN No. 34 [Cost Rs. 7800

This is a plan of a small cottage costing Rs. 7800. It is a very compact building with a kitchen, dining room and a drawing hall all very commodious rooms and a verandah 7' 6" wide on the ground floor. There are three bedrooms, a study and a bath room on the first floor. There is an exit door through the kitchen. Every room receives light and ventilation from two sides. In order to effect economy

of space the doors of all the bedrooms on the first
: FIRST FLOOR PLAN :



: GROUND FLOOR PLAN :

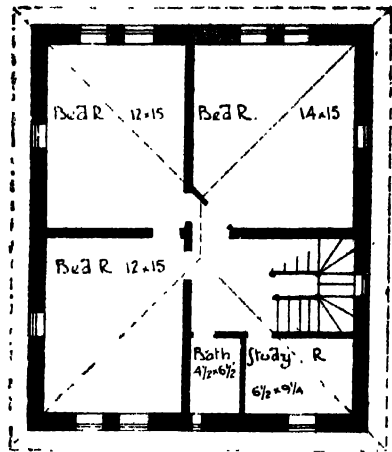
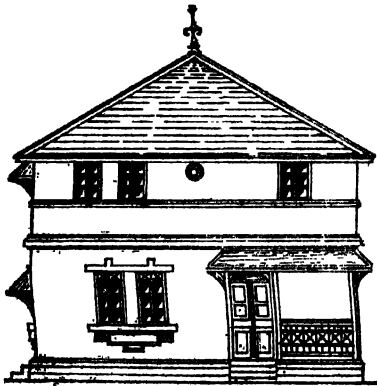


FIG. 110 and 111

floor are arranged at one place in the centre. One



: FRONT ELEVATION :

FIG. 112

standing in the centre can get a full view of two rooms. A square lobby left in the centre with all the doors opening from it is a better arrangement. The Floor area of the cottage is 1986 and Living area 1345 sq. ft. which is

68 p. c. of the former, the cottage would cost about Rs. 7800 to construct.

Floor Area 1928] PLAN No. 35 [Cost Rs. 8000

This is an ordinary plan of a house costing

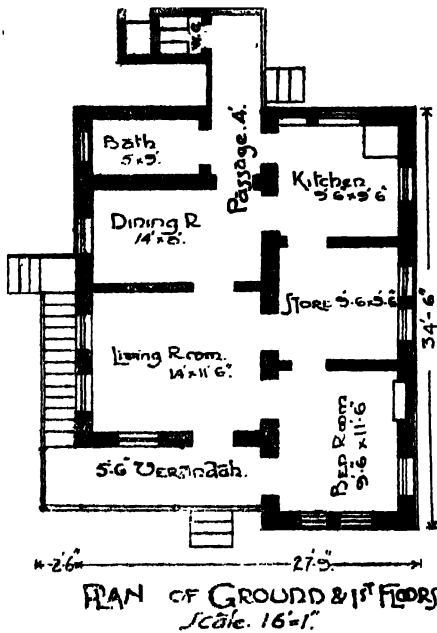


FIG. 113

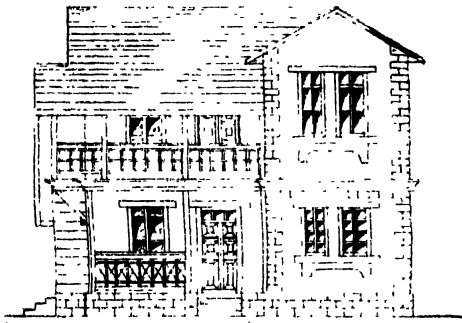


FIG. 114

about Rs. 8000 for two floors. It contains all the accommodation ordinarily required. There is a latrine on the basket or conservancy system at the rear side, cut off from the main building by a short passage. However if it could be removed further it would be better. The number of rooms is more but they are rather small. If it is desired to let the upper floor as an independent flat, there is a staircase from the outside leading to it. If both the floors are to be used by the same family a door in the corner of the dining room just near the landing

at plinth level would be very convenient. As far as possible a staircase should be inside the house. The Floor area of the house is 1920 sq. ft.

The Living area is 1290 sq. ft. and is 67 p. c. of the F. A.

Floor Area 2112] PLAN No. 36 [Cost Rs. 8600

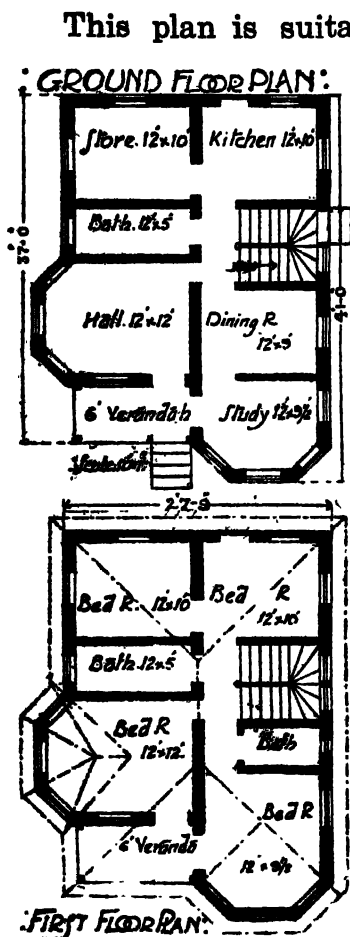


FIG. 115 and 116

This plan is suitable for a long narrow plot facing South. There is a small verandah on the ground floor adjoining which a small room for study is placed. The bath room which is 12' x 5' is well situated so as to be independently accessible from every room. The kitchen and store are close together and the dining room is arranged beyond the staircase. There is an exit door on the rear side below the staircase landing. On the first floor are arranged four bed rooms with one bath room common to two bed rooms. The two front bed rooms get the advantage of the verandah. Thus this is a

compact and convenient plan. The roof also is very simple in construction. The store room on the ground floor can be utilised as an occasional bed-

room. The Floor area of the structure is about 2112

FRONT ELEVATION.

Scale. 10-1

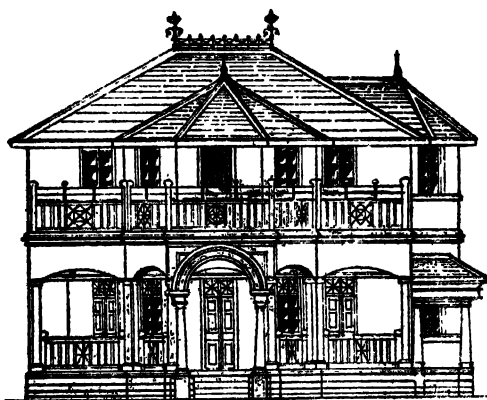


FIG. 117

sq. ft. with cost amounting to Rs. 8600 and the Carpet area which is about 1374 sq. ft. is 65 per cent of the Floor-area.

Floor Area 2000] PLAN No. 37 [Cost Rs. 8900

This is a small cottage suitable for a site on the

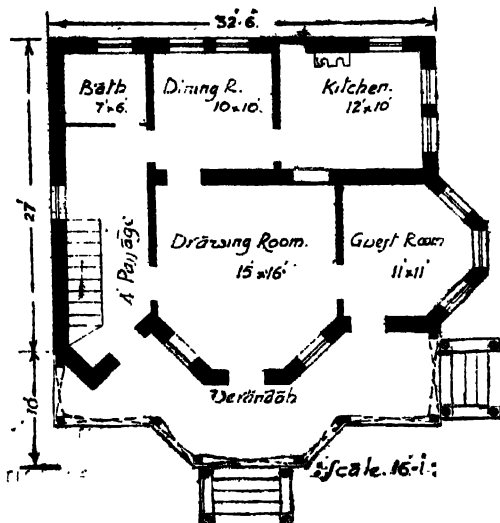


: FRONT ELEVATION :

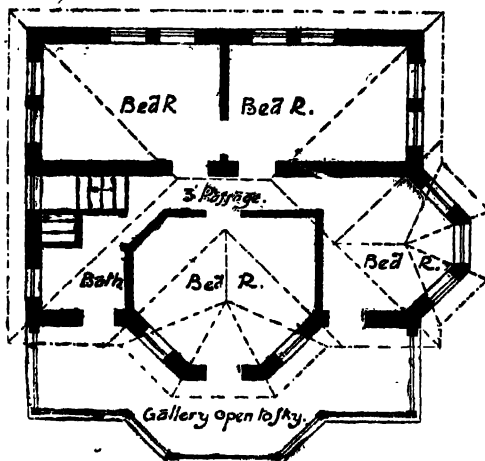
FIG. 118

outskirts of a town facing South or South-West.

The drawing room is 15' x 16' plus the semi-hexagonal area and is protected from the sun by a deep verandah.



GROUND FLOOR PLAN:



: FIRST FLOOR PLAN:

FIG. 119 and 120

the privacy of any room. The communicating door between the two rear bed rooms shown in the

gonal area and is protected from the sun by a deep verandah. The latter would be very useful as a sitting out place. The bath, dining room and kitchen are very well situated with respect to each other. The guest room is in the front and quite independent. The staircase has got quite an independent entrance. Still it is within the gaze of people inside. On the first floor there are four bed rooms, a bath and an open gallery in front. Every bedroom is a separate unit and the bath is approachable from each without disturbing

plan may be omitted if necessary. The cottage looks smart in elevation. The Floor area is about 2000 sq. ft. and the Carpet area of both the floors together, about 1460 which is 73 p. c. of the former. The building would cost about Rs. 8900.

Floor Area 2172] PLAN No. 38 [Cost Rs. 8900

This building which is designed to face the

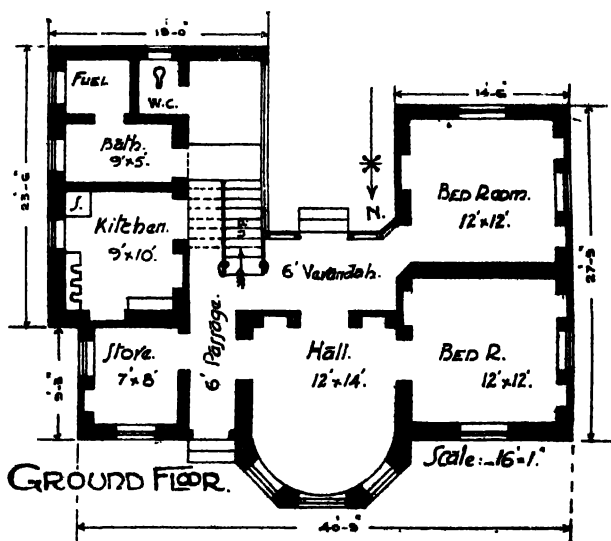


FIG. 121

North combines a beautiful elevation designed on principles of symmetry with convenience of arrangement. The entrance is in a 4 ft. passage on the left of the central bay. The front hall has got hexagonal corners on the outside, but the wall is rounded into a semicircle on the inside—a very good arrangement from the point of view of nuisance of dust which always accumulates in corners. The bed rooms are situated on the West. If the addition of a verandah on the West beyond the bedrooms be

within one's means it should by all means be done. In its place a cheap wooden trellis structure with a vine trained on it would serve the purpose equally well. There is no separate dining room. Hence the verandah behind the drawing room is the only place

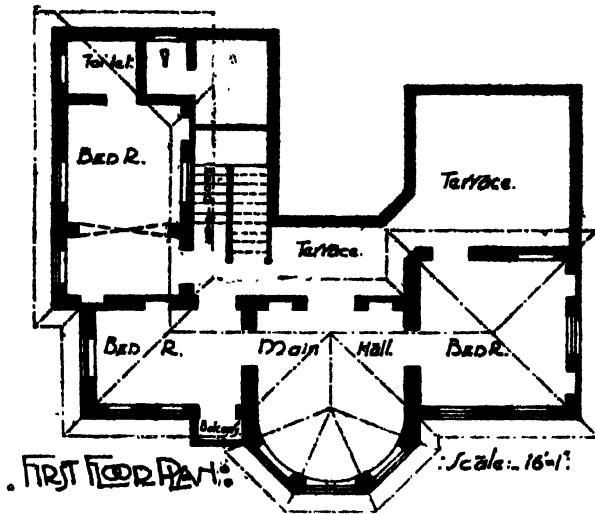


FIG. 122

which can be used for that purpose. The position of the entrance to the rear bed room is not a happy one.



FIG. 123

FRONT ELEVATION.

The plinth area of the ground floor is 1220 sq.ft. and the total Floor area 2172, the cost being about 8900.

Floor Area 2268] PLAN NO. 39 [Cost Rs. 9000

This is another convenient plan. The drawing hall which is comparatively a very commodious one

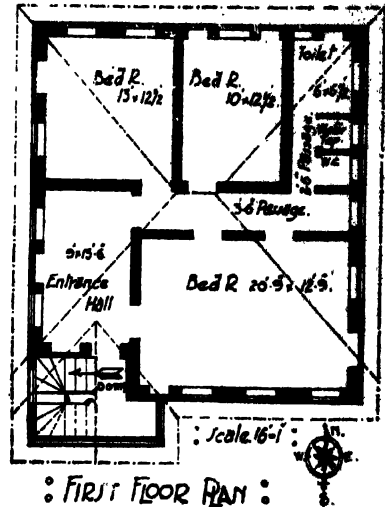
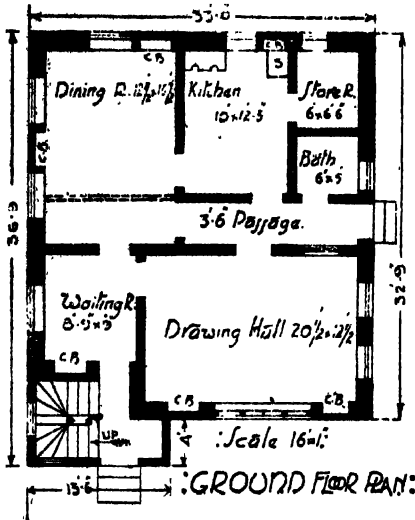
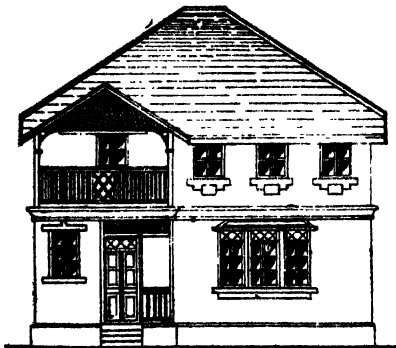


FIG. 124 and 125

is entered through a small lobby or a waiting room.



: FRONT ELEVATION. :

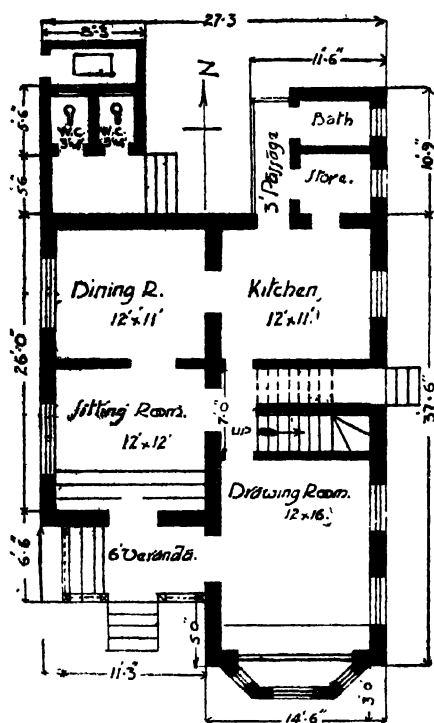
FIG. 126

The dining room also is a sufficiently big room. The kitchen and store rooms are conveniently situated with respect to each other. The bath-room is approached through a lobby. The staircase is situated in such a place as does not cause any inconvenience. On the first floor there are three bedrooms similarly

placed with a common toilet and a water-tap room. For supporting the front half brick partition wall of the bed room on the upper floor on the left hand side, a rolled steel beam, shown in double dotted lines on the ground floor plan is provided. The Floor area is 2268 sq. ft. and Living area 1386 sq. ft. the latter being .61 p. c. of the former. The cost of the building is about is Rs.9000.

Floor Area 2370] PLAN No. 40 [Cost Rs. 9600

This is a plan suitable for a long and narrow site facing South or South-west.



GROUND & FIRST FLOOR PLAN:

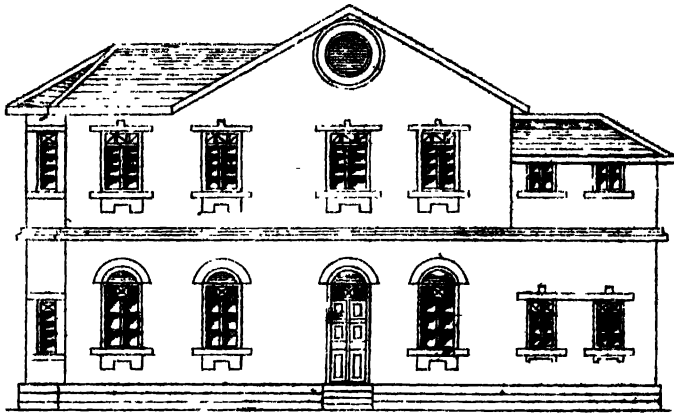
Scale - 1/16" = 1'

FIG. 127

In the front there is just a small verandah which opens into a drawing room. The latter is spacious enough for a small cottage like this. There are besides, a kitchen, a dining and a sitting room, all of which are decent sized. A small store and a bath room are placed beyond the kitchen with a 3 ft. passage in their front. On the left hand side are placed two w.c.s. which are partially on the water carriage

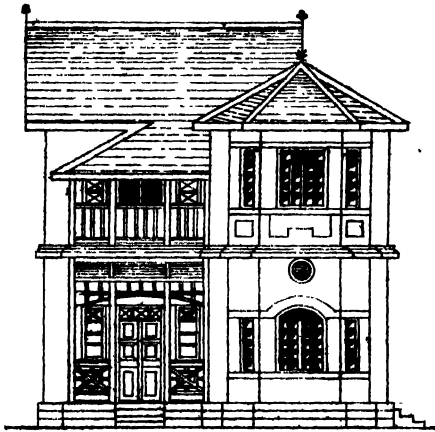
system i. e. all refuse is carried by water to a

cess-pit from which it is daily removed in bullock



SIDE ELEVATION

carts. However, it would have been better if they were placed on the opposite side i. e. East, near the bath room. The staircase on one side with a separate entrance to it makes it possible to rent out the upper flat as a separate tenement. The Floor area is 2370 sq. ft. and the cost is Rs. 9600.



:FRONT ELEVATION:

FIG. 129

Floor Area 2800] PLAN No. 41 [Cost Rs. 10000

This is a house actually built in the Saraswat Colony, Poona. It faces West. The walls are of stone in lime, cement pointed on the out-

side and lime-plastered on the inside. The

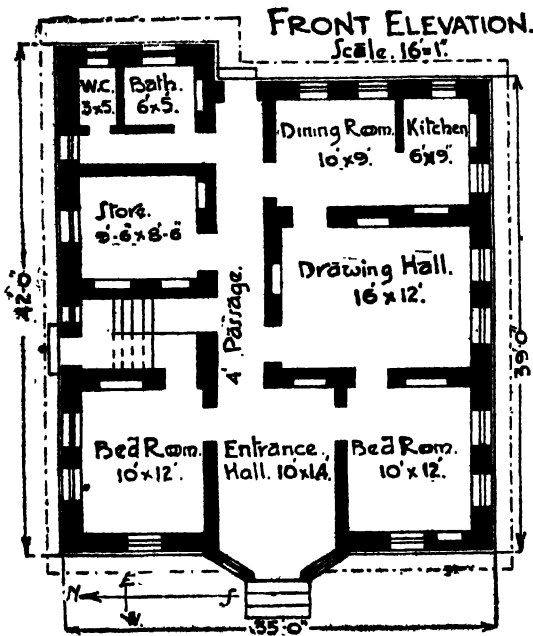


FIG. 130

used as a bed room. For flooring supported on walls

FRONT ELEVATION.

Scale. 16' = 1".

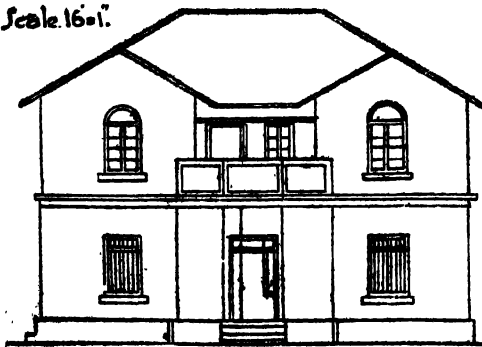


FIG. 131

between the webs. and on the top of this, brick-

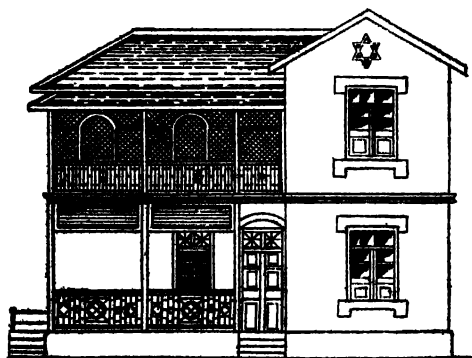
floor is paved with Shahabad stones. Every room has got an independent entrance. The dining room is not a separate one, but a small, thin partition, 5 ft. high which projects about 5 ft. and screens the chullas. The store room can occasionally be

used as a bed room. For flooring supported on walls continuous joists $4\frac{3}{4}" \times 13\frac{3}{4}"$ at 6.5 lbs. per foot are placed one ft. centre to centre and timber waste about 2 inches thick planned on the bottom side is fixed on the lower flange

bat concrete, in lime is laid with either patent stone or Shahabad paving on the top. The first floor which is an independent flat contains the same accommodation as the ground floor. The entrance to the 1st floor is on the left hand side behind the front bed room where a staircase is placed. The Floor area of the building is about 2800 sq. ft. and the actual cost is Rs. 10,000. The height of each floor is 9', plinth 2' and the roof consists of corrugated galvanised sheets with Mangalore tiles above them. The Carpet area is about 1600 sq. ft. bearing a proportion of 57 per cent to Floor area. The absence of a verandah on the West side is a defect in this house which, in consequence, gets hot during night time in summer.

Floor Area 2600] PLAN No. 42 [Cost Rs. 10800

This plan is of a building actually erected in



FRONT ELEVATION. :

FIG. 132

outside. This is specially arranged as it was intended to make the first floor an independent flat.

the Saraswat Brahmin Colony, Poona. It faces the South. There is a small room in front which is very well suited for use as an office or study room. In front of it there is a verandah. The staircase has an opening from the

The drawing room has a good size, but the kitchen

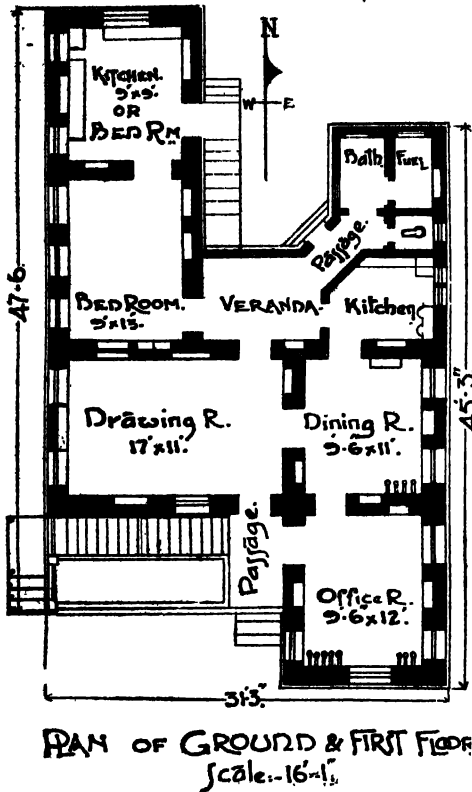


FIG. 133

small shed as an out-building etc.

is too small. Both the bed rooms have got Western aspect and therefore get plenty of breeze. There is a bath, a w. c. and a small room for washing domestic utensils. The same arrangement of rooms prevails on the first floor with an additional staircase on the rear side. The Floor area is about 2600 sq. and the actual cost is Rs. 10,800, including sanitary and electric fittings, compound pillars, fencing and a

Floor Area 2848] PLAN NO. 43 [Cost Rs. 11500

This is one of the excellent few designs suited to Indian style of living. It is suitable for a South facing, but with very slight alterations it can be made to suit a site facing even North. On the ground floor a kitchen, dining, store and bath rooms are all most conveniently grouped together. The drawing room is an enviable one separated from

the kitchen by a wide passage, and the bed room

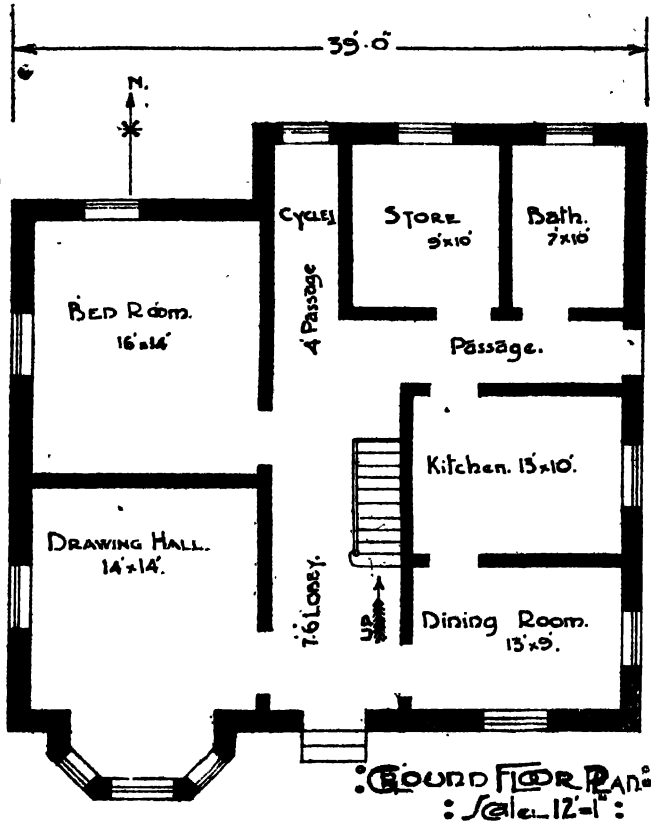
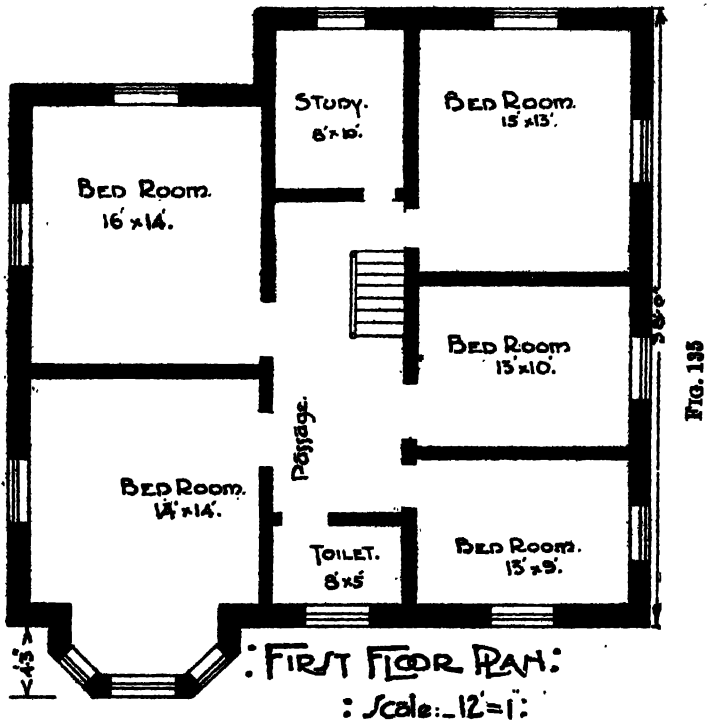


FIG. 134

beyond it would be the best Comfort Room. There is also an exit door behind the kitchen. The staircase is an easy one only in one flight. On the first floor five excellent bed rooms, one small study room and a suitable toilet room common to all bed rooms are arranged. The bay window in front of the drawing hall lends a very charming appearance to the building as seen in the elevation in fig.136. Ordinarily the space below the flight of staircase would be useful for putting bicycles, still that in front near the store room

can be used for storing perambulators. The Floor area



is 2848 sq. ft. and the cost Rs. 11500. The Carpet area which is 1820 sq. ft. is 69 p. c. of the F. A.

Floor Area 3024] PLAN No. 44 [Cost Rs. 13000

This is a plan of a cottage in which there is an accommodation of two flats one on each floor for two

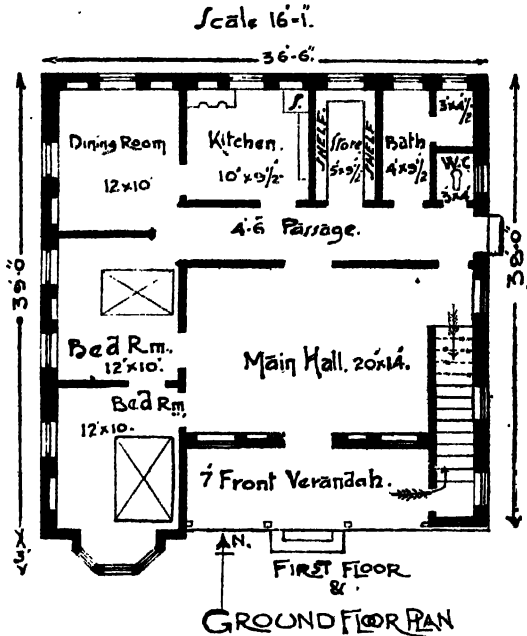


FIG. 137

families. The staircase for the upper flat is in the front verandah. The main hall is a commodious one. If the space below the staircase is taken into account it measures 23' x 14'. The bed rooms are all arranged on one side which if the building is constructed to face the South lie on the West. The positions of beds are shown by the rectangular figures crossed by diagonals. The kitchen being situated on the North side would remain cool. There is a good sized store room with rows of go-down shelves arranged on three sides. The w. c.

is built in the front corner of the bath room; some portion of the latter is thus further screened by it and made more useful for actual bath purposes. Provision of a $4\frac{1}{2}$ ft. passage behind the drawing hall makes the services easily approachable from all

FRONT ELEVATION.



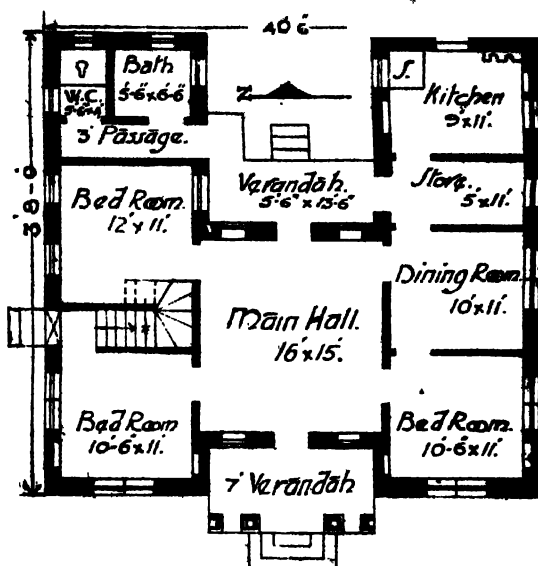
FIG. 138

rooms. There is an exit door on the rear side, opening from the passage. The floor area of the plan is about 3024 sq. ft. and its cost is Rs. 13000. The Living area viz. 1952 sq. ft. is 65 p. c. of the F. A.

Floor Area 2820] PLAN No. 45 [Cost Rs. 12500

This is another design of a cottage on the flat system each floor having a separate self-contained independent flat. The ground floor consists of verandahs on the front and rear side, a central main hall, three bed rooms, a kitchen, store, dining, bath room and w. c. The staircase has a direct entrance from the outside on the left hand side. However, if both the flats are to be used by the same family there is an inside entrance also kept for it. The bath room and w. c. block is connected

to the rear verandah by a small passage. The



GROUND FLOOR.
ft. etc. 16'-1"

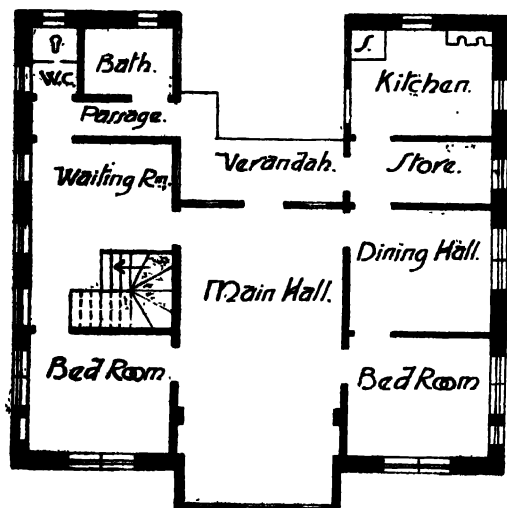


FRONT ELEVATION.

FIG. 139 and 140

front verandah which is 7 ft. wide can be very well

used as a waiting room. The plan is designed for a West facing.



FIRST FLOOR.
Scale 1/16"

FIG. 141

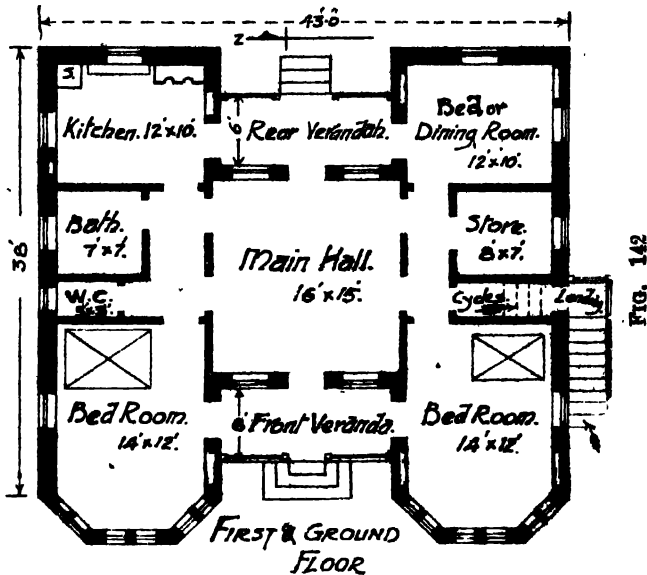
The arrangement on the first floor is the same except that the front verandah is incorporated into the hall and the walls at either end are projected a little so that it is possible by constructing a sliding partition there to convert the space on the

front side into an occasional bed or ante room. The Floor area of the plan is 2820 sq. ft. and the cost is approximately Rs. 12500. The Living area viz, 2076 sq. ft. is 64 p. c. of F. A.

Floor Area 3260] PLAN No. 46 [Cost Rs. 13500

This is another cottage designed on the flat system, so that there are two tenements one on each floor self-contained in every respect. The staircase leading to the first floor has got an independent entrance from outside. There is a front verandah 6' ft. wide on the sides of which there are two bed rooms of a very good size viz, 14' x 12'. The cottage is designed to face the West side, hence the bedrooms are located in the front. The main hall of 16 ft. x 15 ft. protected on both sides by verandahs

would be a very cool place. The services viz, the bath and w. c. are made independently and easily



accessible by the provision of a lobby. The kitchen is as required in the North-east corner. Ordinarily the

FRONT ELEVATION.



rear verandah would serve the purpose of a dining room. However, if additional space is required for that purpose, the bed room in the South-east corner

can be used. The space inside the house below the 2nd flight of stairs can be included in the store room by omitting the intermediate partition wall.

The Floor area is nearly 3260 and the cost of both the floors is Rs. 13500. The Living area is 2112 sq. ft. which is 65 p. c. of the F. A.

Floor Area 3240] PLAN NO. 47 [Cost Rs. 14500

This rather an attractive plan is suitable for a South facing specially designed for comfort. The semi-circular bay window on the South-west corner encircled by a similarly shaped verandah is a special feature. The drawing room

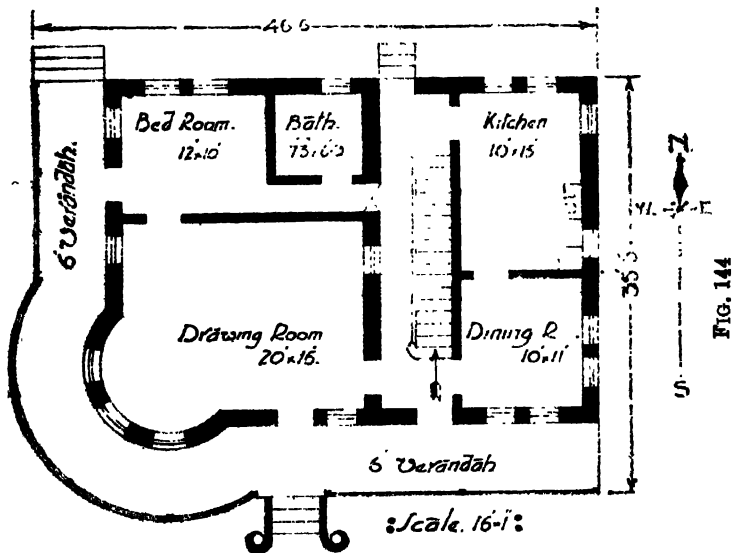
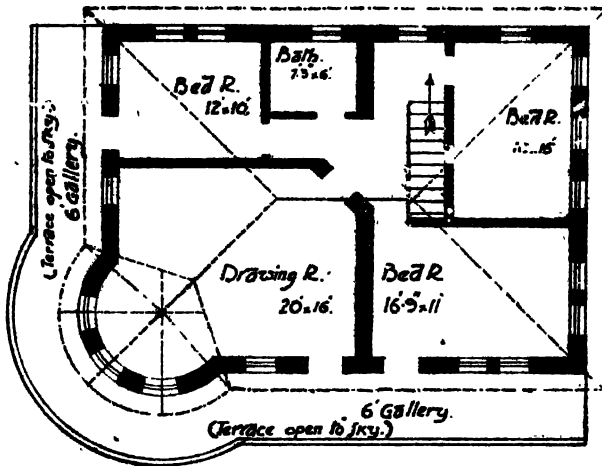


FIG. 144

° GROUND FLOOR PLAN °

is very commodious. The verandah on South and West will keep the cottage cool. There is a spacious kitchen, a dining room and a bed room with a small bath room on the ground floor and

four bed rooms and a small bath room on the first. A terraced roof is constructed on the verandah and a turret on the bay portion of the drawing room. The



: FIRST FLOOR PLAN:



: FRONT ELEVATION:

FIG. 145 and 146

Floor area is 3240 and cost is Rs. 14500. The Living area is about 2355 sq. ft. and is 72 p. c. of the F. A.

Floor Area 3240] PLAN No. 48 [Cost Rs. 14650

This is a plan of a house actually built. It is

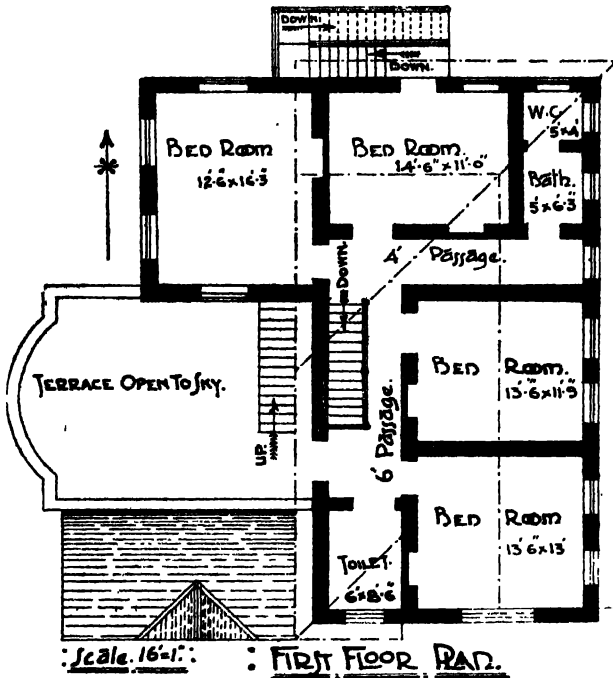


FIG. 147

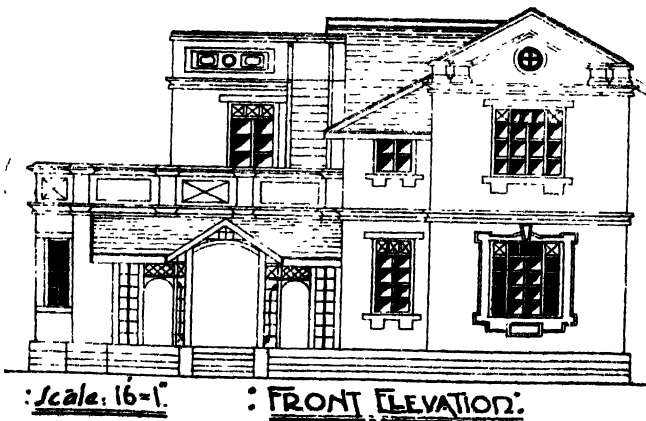


FIG. 148

very good in respect of convenience but its eleva-

tion is rather poor. The verandah on the front serves as a good waiting room. The drawing room behind it is sufficiently commodious. The bath room, kitchen and dining room are conveniently grouped with respect to each other. The kitchen is rather small, though the spacious dining room and a

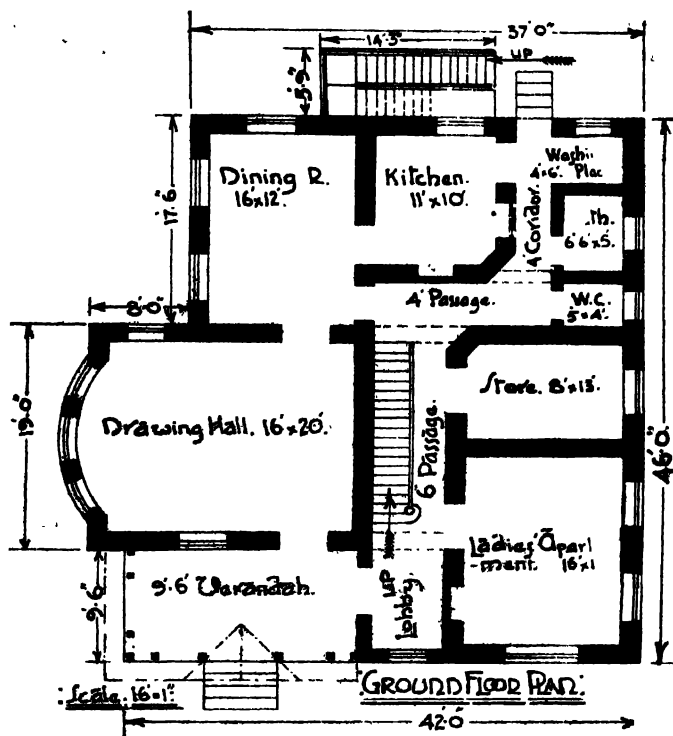


FIG. 149

separate store room will compensate for it. The store room is rather far removed from the kitchen. The w. c. is on the flushing system, hence its proximity to kitchen is not objectionable, still it had better been a little away. The corridor from one end to the other maintains the privacy of every room. On

the first floor four bed rooms of decent sizes, a toilet and a small bath and w. c. combined are provided and a terraced roof constructed above the drawing room. There is a staircase on the lower terrace for going on the top of the upper one. It is, however, exposed to view and gives a poor appearance to the elevation. The floor area is about 3240 sq. ft. and the approximate cost Rs. 14650.

Floor Area 3672] PLAN NO. 49 [Cost Rs. 15000

This is a plan of a very convenient cottage. A six ft. verandah in the front leads directly into the

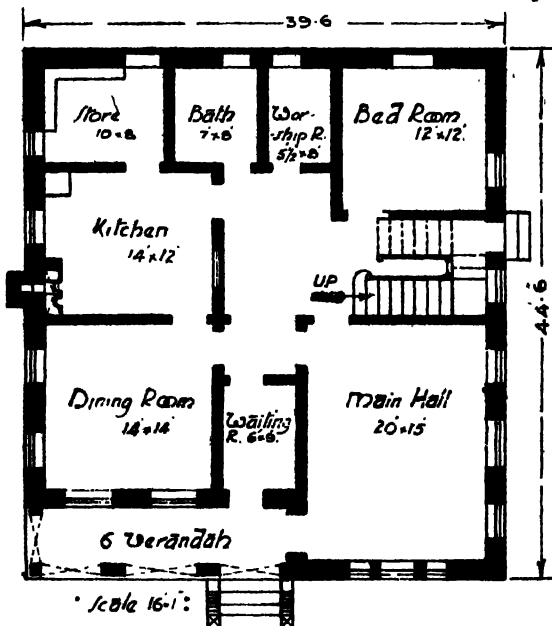


FIG. 150

° GROUND FLOOR PLAN °

main hall of 15' x 20', a very good size for ordinary cottages. There are besides, a kitchen and a dining room, both of a very decent size. A bed room which

will serve as a Comfort Room and a store room of

∴ FIRST FLOOR PLAN ∴

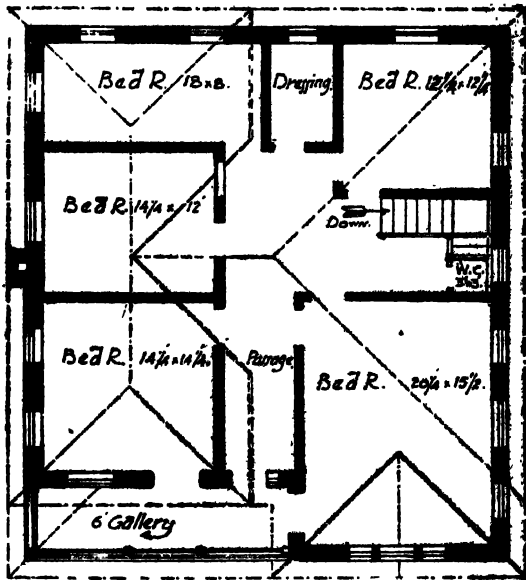


FIG. 151

10' x 8' near the kitchen add to the conveniences. A



FIG.

∴ FRONT ELEVATION ∴

small worship room is a special feature. The bath

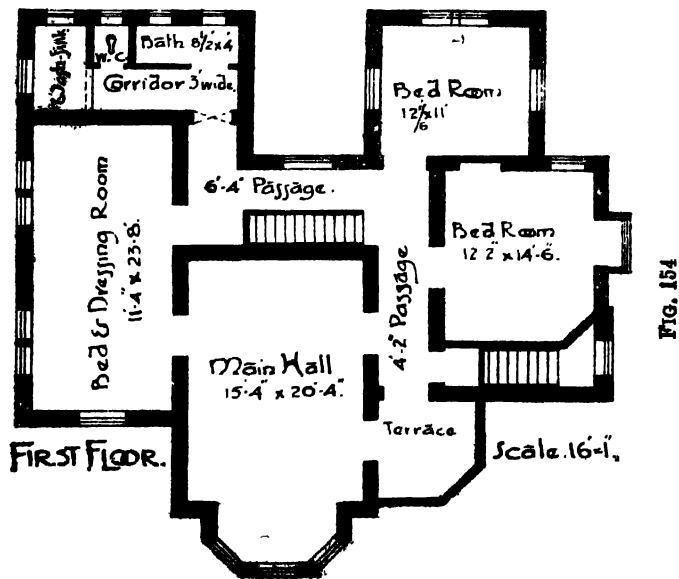
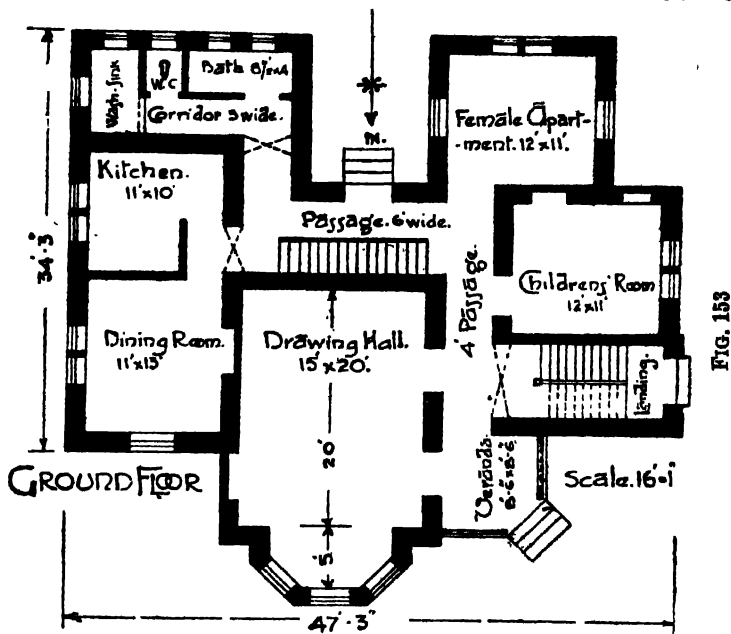
and staircase are very conveniently situated and the latter has got a very easy rise. Below the staircase landing there is a back exit to a privy which is kept away from the main building.

On the 1st floor there are 5 bedrooms and a dressing room; a 6 ft. gallery is so situated and connected by a common passage that it can be easily used by all. The sizes of all the bed rooms are very good. In short, it would be a luxury for the middle class people to live in such a commodious and well planned house. The Floor area is 3672 sq. ft. and the Carpet area of both floors together is 2240 sq. ft. The ratio of the latter to the former is 65 per cent. The cost is Rs. 15000.

Floor Area 3340] PLAN No. 50 [Cost Rs. 15400

This is a very convenient design of a cottage actually built. It is suitable for a plot facing North. The main staircase is placed in the front in such a way that not only it is screened from view from the outside but has got a separate entrance to it both from the inside and outside. The latter convenience is very useful if the upper floor is desired at any time to be let as a separate flat. The drawing hall is commodious rather on a pretentious scale. The children's room should prove excellent even for study. The female apartment is on the S. W. side getting the maximum benefit of breeze. In the rear verandah is placed a back staircase which is so essential for privacy and safety in times of outbreak of fire. The kitchen entrance is screened by the right angled light partition which also provides an entrance to the dining room. There

is a dead wall between the kitchen and the block of



bathroom and w. c. The latter is on the flushing system. Where there is no water-carriage system the space may be utilised for storing coal etc. There is a small open yard on the rear for a *Tulshi*



: FRONT ELEVATION:

: Scale. = 16'-0"

FIG. 155

Vrindavan. On the first floor more or less the same arrangement may be made if it is desired to make a separate flat or the kitchen and dining room may be turned into bed rooms. The Floor area is about 3340 sq. ft. and its cost is Rs. 15400.

Floor Area 3475] PLAN No. 51 [Cost Rs. 15000

This is one of very good compact plans best suited to Indian conditions and social customs. It is suitable for a South facing. There is a front verandah 8' ft. wide to serve as a waiting room, behind which is a main hall 18 ft. by 14' ft.—a very decent size for a drawing room. It is open on three sides. Opposite the hall is situated a guest room 12 ft. × 14 ft. It is quite isolated from the remaining house except the drawing hall. The guest can make use of the bath and w. c. independently

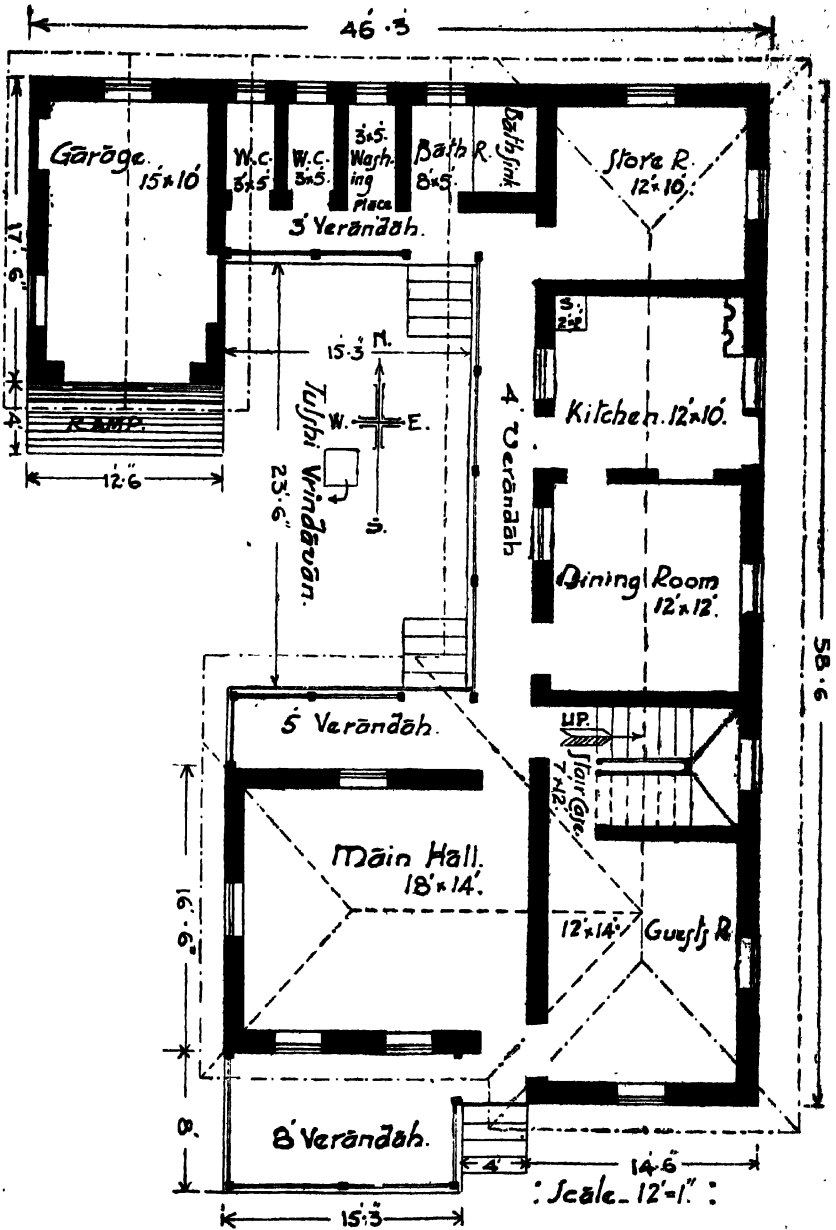


FIG. 156

: GROUND & 1st FLOOR PLAN :

through the open *chowk*, without disturbing the privacy of the kitchen, dining room or even the drawing room. The position of the staircase is an ideal one. It preserves the privacy and at the same time allows it to be occasionally used by a stranger. It is sufficiently wide and has an easy rise. If possible the two winding steps in the landing should be eliminated. For this either all the rooms may be made 14 ft. wide instead of 12 or



: FRONT ELEVATION. :

FIG. 157

better still, the landing should be made on a projecting balcony, roofed over. The kitchen, dining and store room are best situated in their relation towards each other. If desired the store room can be utilised either as a prayer room or as a 'Comfort Room' for the aged member of the family, being situated in an undisturbed place, but at the same time near the kitchen so that necessary service can be

rendered promptly and with ease. Bath, washing room and w. c.s are situated very well with respect to other rooms enclosing an open yard with the so-beloved *Tulshi* plant situated in the centre. The plan provides for the best possible ventilation and light. The hot breeze blowing from the West will to a certain extent be cooled by the verandah on that side. For the proud possessor of an automobile a garage is also shown. 5 or 6 independent bed rooms may be provided on the 1st floor. The Floor area is 3475 sq. ft. exclusive of garage and its cost is less than Rs 15000.

Floor Area 3590] PLAN No. 52 [Cost Rs. 16000

This plan of a cottage is suited to a long and narrow site. It is actually built at Khar, a suburb of Bombay, though with a different elevation. In the



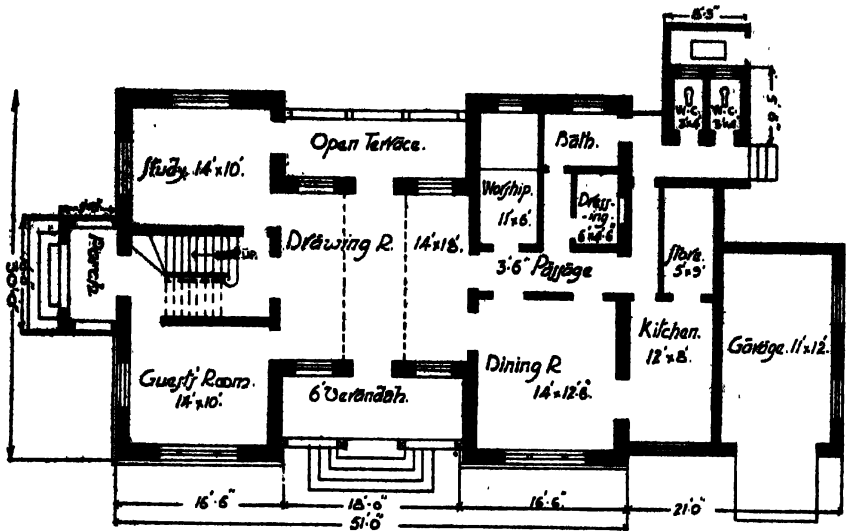
Scale—1/16"=1'

∴ SIDE ELEVATION ∴

FIG. 158

front there are two rooms called in the plan, a study and a guest room; in the centre there is a staircase, opening from the inside. Behind these is

placed the drawing room of 14 ft. by 18 ft., which

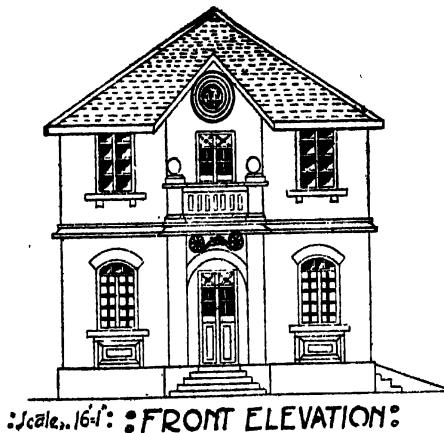


: GROUND & FIRST FLOOR PLAN :

: Scale: 1/16" = 1' :

FIG. 159

derives light and ventilation on both sides. A long



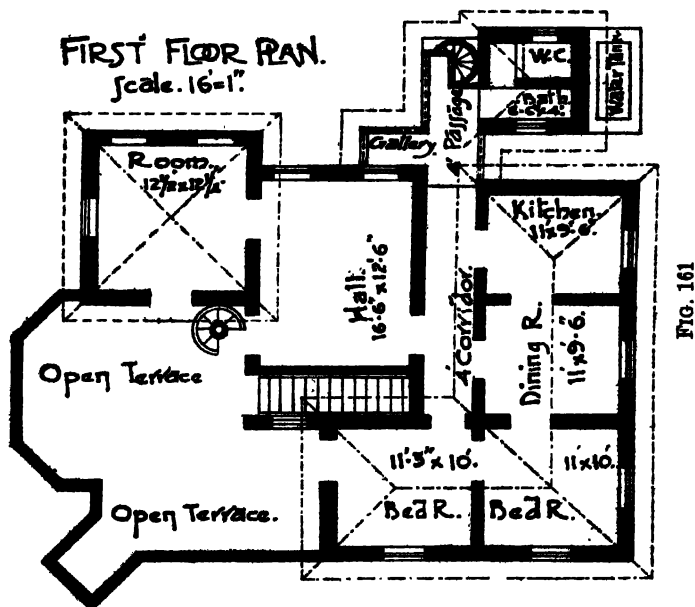
: Scale: 1/16" = 1' : FRONT ELEVATION :

FIG. 160

and narrow kitchen with a small store room attached to it and a decent-sized dining room which

also serves as a ladies' apartment make the house very convenient. In front of the dining room are placed a small worship room $11' \times 6'$ and a small dressing room with a bath behind, approached by a lobby. Both these are made independently accessible by the provision of a $3' 6''$ wide lobby. The two w. c.s are privies on the intermediate system. Separated from the kitchen but attached to it by a blind wall is a motor garage $11' \times 12'$. On the first floor bed rooms may be arranged as desired. The floor area exclusive of that of the garage is 3540 s. ft. and the cost of the building is about Rs. 16000. Two elevations—front and side—are shown in figs 158 and 160. **Floor Area 3200] PLAN No. 53 [Cost Rs. 15500**

This is a cottage actually built in the Deccan



Gymkhana Colony, Poona. It combines in itself

artistic beauty of elevation with a convenience of arrangements. It is situated in a corner at the junction of two roads on the South and East sides. The peculiar feature of the small arched vestibule situated at corner turned at an angle to the front verandah lends considerable charm to the front elevation. The bed rooms on the ground floor have

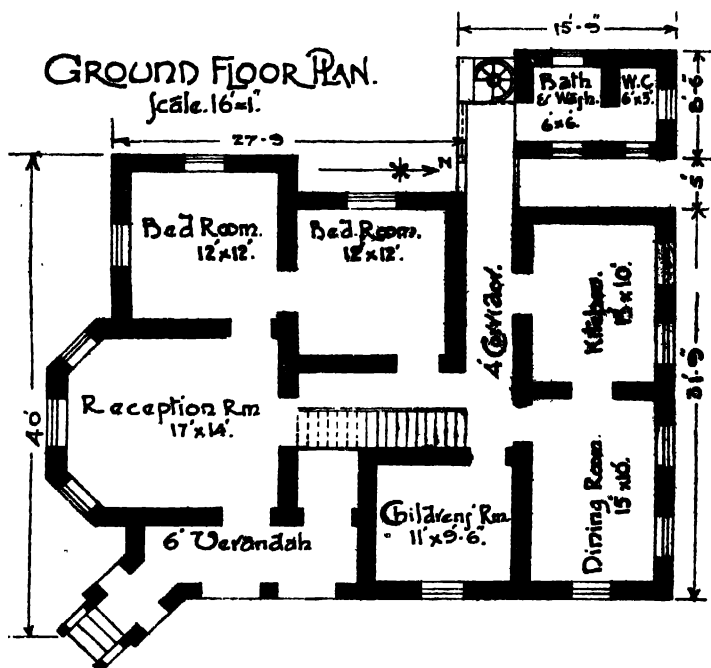
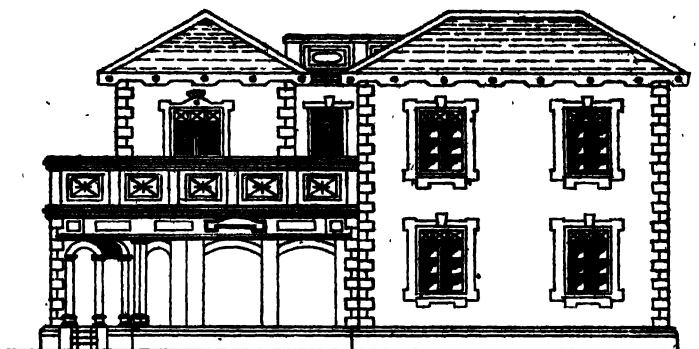


FIG. 162

got a Western aspect and get the benefit of a free breeze cooled by shady trees on that side. The reception room has a decent size of 17 ft. by 14 ft. and accommodates with ease a few chairs and a chasterfield suite. The provision of the bay window in it ensures it to be flooded with invigorating sun's rays and a breeze in all seasons of the year. The entrance to the reception

room from the verandah being placed in a corner makes it free from any disturbances. The children's room has a sunny aspect on the East. That room being secluded from the neighbouring ones would



: FRONT ELEVATION :

: Scale. 16'-1" :

FIG. 163

prove an ideal place for study. The kitchen is separated by a corridor and the bath and w. c. block is still further cut off from it by a small space open to sky. The staircase is situated at a convenient place, so that it is independently accessible from any room on the ground floor.

On the first floor a separate flat is indicated, but the entrance to the staircase being in a lobby in the heart of the cottage it is not so convenient. For reaching the staircase from outside one has to take three turns in the lobby which means disturbing the privacy of the reception, bed, childrens' and dining room occupied by members of a different family. The house is therefore more suitable for one family unless the position of the staircase is altered. A terraced roof is constructed on the top of the reception room. The detached

roof on the square room in the South-west corner on the first floor with the intermediate terrace roof on the hall is another feature which has added an expression of beauty to the elevation. There is a spiral staircase for servants on the rear side. The Floor area of the building is about 3200 sq. ft. and the cost of the house is Rs. 15500.

Floor Area 3425] PLAN No. 54 [Cost Rs. 16000

This is one of the very convenient plans of

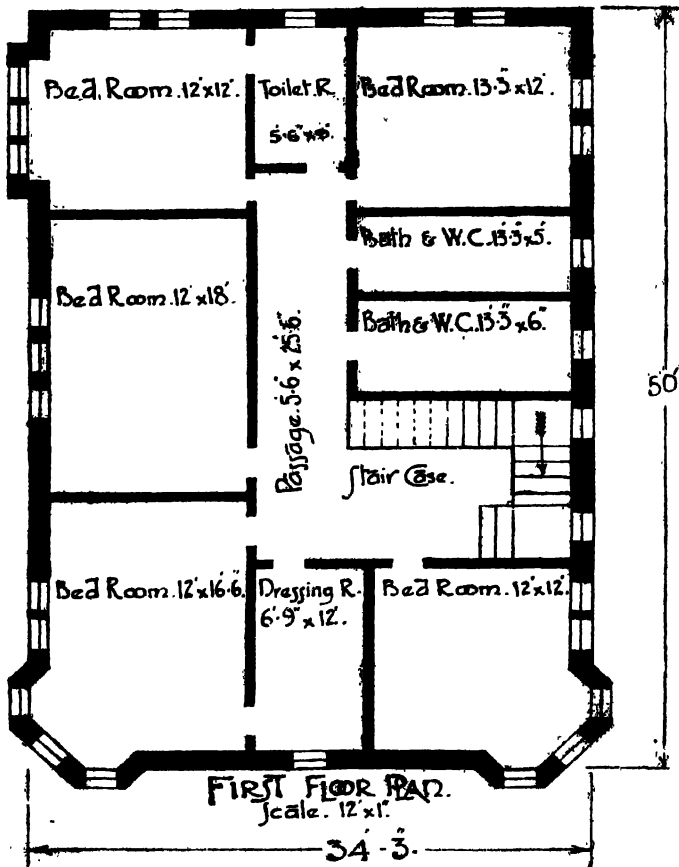


FIG. 164

a cottage rather on a pretentious scale. It is suitable for a site facing the South. On the ground floor the front room on the right hand side has the special advantage of getting breeze on the South and the health-giving morning sun on the East. As such if a few more comforts are provided it would be an excellent Comfort Room for the sick or the aged member of the family. The special feature

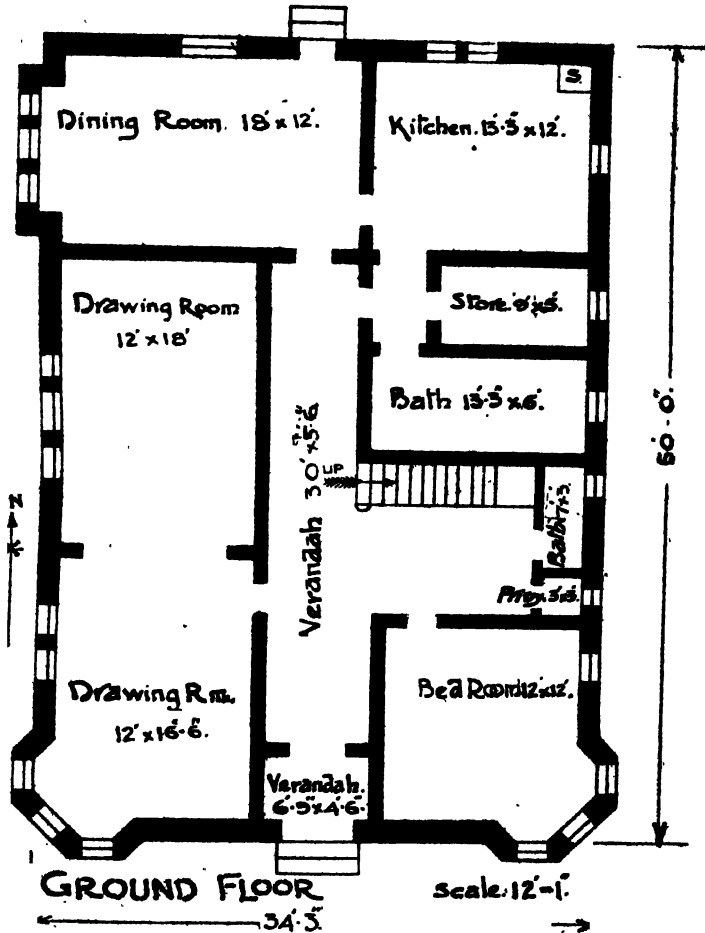


FIG. 165

of the cottage is its drawing room. The arrangement of two ends of partition walls extending a foot or two from each side and rising in an arch closed either by an easily detachable light wooden partition or sliding shutters is very convenient for occasionally making one big room out of two. The staircase opens in the central lobby at a convenient place and has got a comfortable rise. The space below its landing is utilised for a w. c. and a bath room for gents. The former is to be strictly



FIG. 166

a water closet on the flushing system. A privy on the conservancy system cannot be allowed inside a house. There is another bath near the kitchen for the ladies. The dining room is a very spacious one. The space below the first flight of staircase would be useful for cycles or a pram. The long passage is unavoidable. Great care must be taken to light it sufficiently. On the first floor there are five decent-sized bed rooms, two bath rooms, one ladies' toilet room and one gents' dressing room. For lighting the passage upstairs a skylight should be provided in the roof. The Floor area of the house is 3425 sq. ft. of both floors together and its cost about Rs. 16000.

Floor Area 4500] PLAN No. 55 [Cost Rs. 21000

This is a plan of a building actually con-

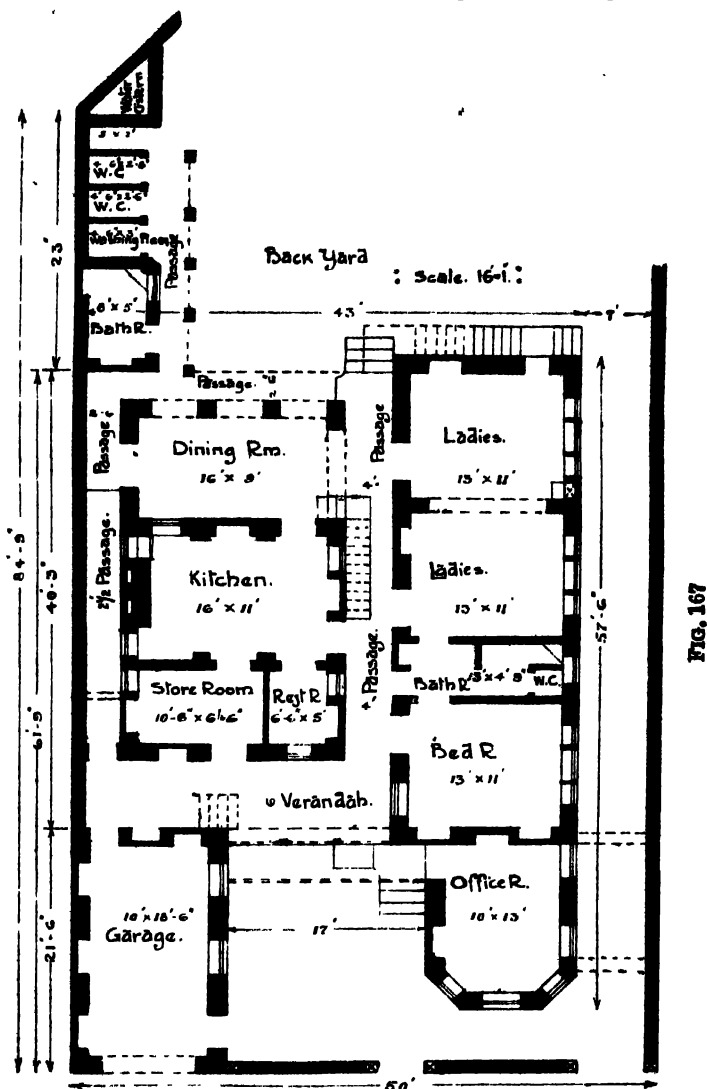


FIG. 167

: GROUND FLOOR PLAN :

structed. The site slopes very much towards the

three sides and is the most undisturbed place. Behind it is placed a bath and w. c. only for casual use. The room still behind it, called "Ladies" is specially designed to serve as a "Comfort Room" for the sick, the aged or ladies in confinement, when the rearmost room which is an ante-room would serve a room for the attendant. On the left hand side, behind the front verandah are placed a small store room and another one useful as a worship room, behind it are kitchen and dining rooms, both of excellent dimensions. A narrow passage behind it leads one to the bath room and



° FRONT ELEVATION. °

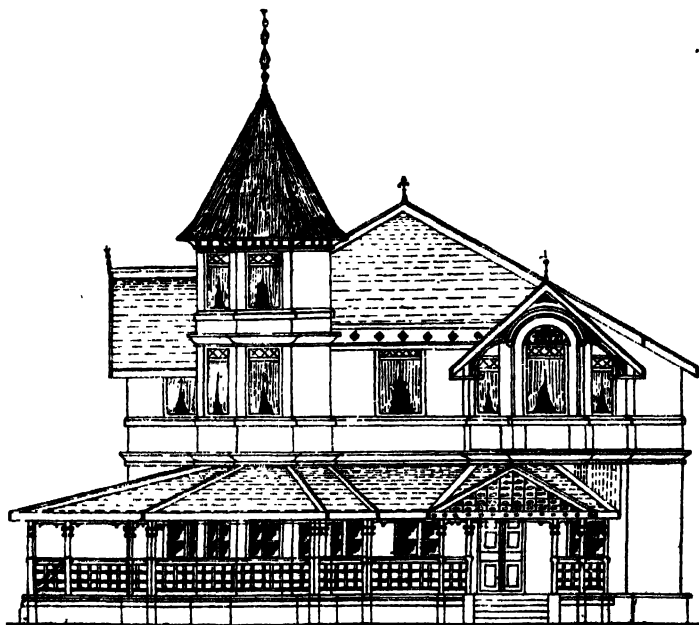
FIG. 169

w. c.s which are built on the flushing system. A garage and a small open yard in the front and rear, further add to the conveniences of the cottage. There are two staircases, both without any winding steps. Upstairs, an additional bed room is constructed on the top of the garage which is open on three sides and instead of the partition wall between the kitchen and dining room an arch is built, making a very spacious hall, in which the

space occupied by the store and worship room below is also incorporated. When it is intended to make an independent flat on the upper floor and rent it out separately the same arrangement of a kitchen, dining and store room etc. can be easily made by putting partition walls. Fig. 169 shows an elevation from which it will be seen that another floor on a few rooms on the top of the first has been constructed and a small turret raised on the top of the office room. The area of the two floors only is 4500 sq. ft. and the cost is Rs. 21000.

Floor Area 5380] PLAN No. 56 [Cost Rs. 29000

This plan is designed for a South facing.

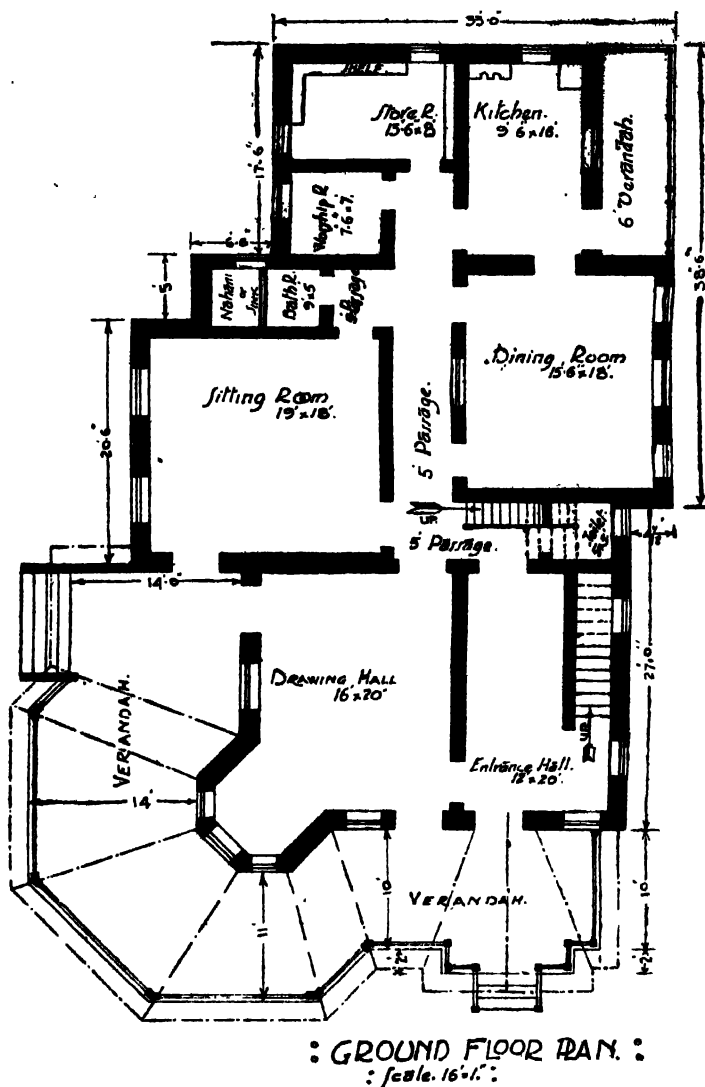


: FRONT ELEVATION. :

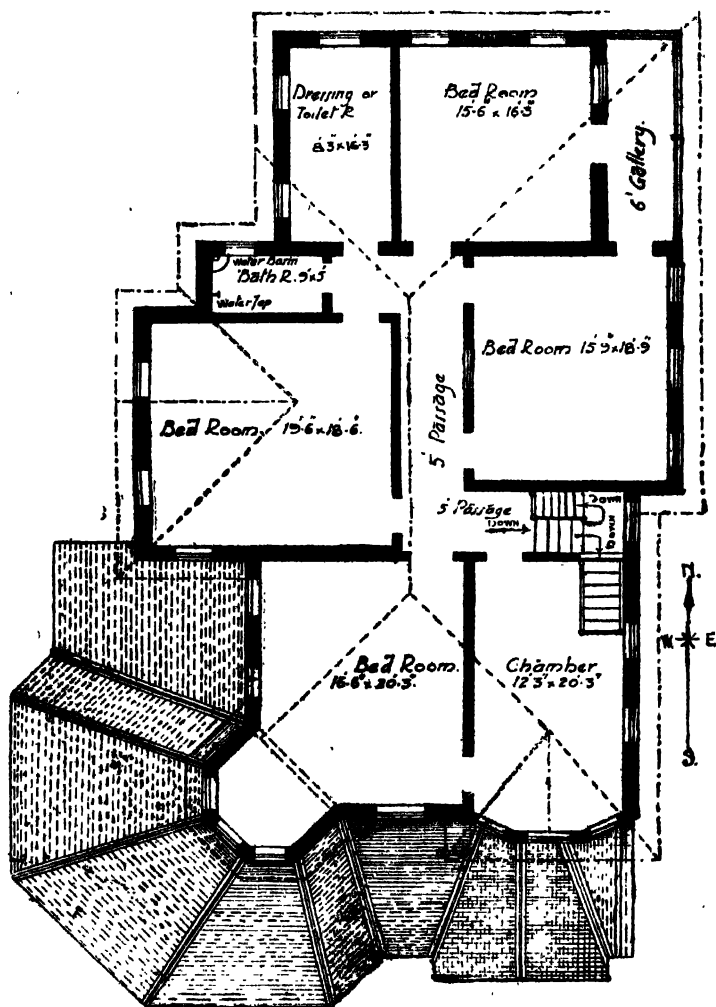
FIG. 170

There is a verandah on the front side on the South

and West side which is of a varying width. Behind it is placed a drawing hall of 16' x 20' plus the



case is placed in the entrance hall and the subsidiary one on the rear side with upper flight and



° FIRST FLOOR PLAN °

FIG. 172

landing common to both. On the rear side, the comparatively large sitting room of 19' x 18' may prove an excellent Comfort Room which is close to a bath

room. The dining room also is a spacious one. The elongated kitchen is excellent with a small verandah on one side and a store and worship room on the other.

On the first floor five very good bed rooms, a dressing and a small bath room are provided with separate entrances to each. A detached roof is constructed on the top of the verandah and a turret built on the top of the bay projection. Fig. 170 shows the front elevation and fig. 173 a perspective view of the cottage. The Floor area is 5380 sq. ft. and the cost Rs. 29,000.

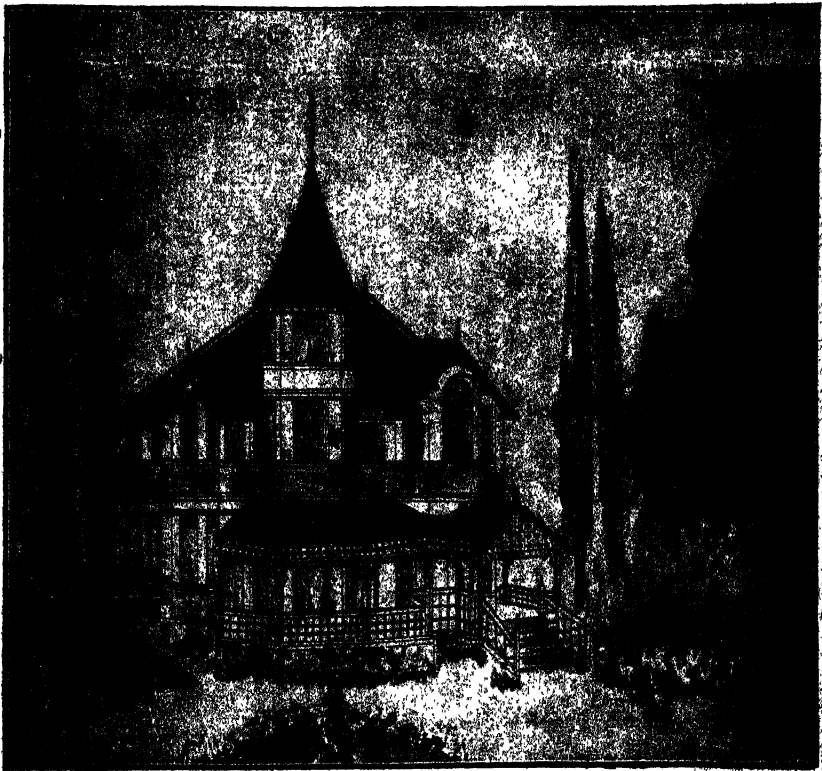


FIG. 173

TERRACE HOUSES.

The intense house-famine in certain industrial cities like Bombay, Ahmedabad, Sholapur and Calcutta has forced up the house rents abnormally high and compelled people particularly of the lower middle and poor classes to live amidst insanitary conditions caused by over-crowding—such as want of light and ventilation, absence of domestic hygiene, presence of filth, dampness etc. * “According to the census report of 1921, there are in Bombay 1,75,001 one room tenements.” “Many of the rooms are occupied by more than one family, the rent of these rooms is from Rs. 10 to 12 per mensem, the average earning of this class being Rs. 30 p. m.” “For eight months in the year in Bombay, Calcutta and Madras many people sleep in the open paths, streets, oarts and wadis”!

The chawls are peculiar to Bombay. They are buildings generally 2, 3 or even 4 storeys high, so constructed as to be suitable for letting in separate tenements of a single or two rooms, but not of more than two rooms. There is only one central semi-fireproof staircase as the main thoroughfare for upper floors; each tenement is separated by party walls, there is a common passage, about 4 ft. wide, in the front or the rear. One or two wash-houses and bath rooms and a few w. c.s, which are always inadequate in number are provided for common use as a separate apper-

* Sanitation in India by Turner and Goldsmith page 968.

tenance connected either by the front or rear passage. The rooms are packed together and piled up in a very limited area, with no gardens, no separate yards and absolutely no privacy outside the room door. The inhabitants occupying them especially by night far exceed the accommodation in number, and thus light and air are reduced to a quantity far below the standard requirements. The gullies or the narrow spaces between two blocks of chawls are imperfectly paved and are not watertight. They carry an open drain for sullage water which is choked up by refuse of all kinds thrown by people living on upper floors, which rots and gives a bad stink to exclude which the windows which overlook them have to be closed. Thus the chawls tend in general to establish a low standard in respect of comforts and decency and have often a demoralizing effect.

The terrace houses are quite separate independent units with a small yard either in front or rear or both and are far superior to chawls described above.

Floor Area 430] PLAN No. 57 [Cost Rs. 1800

This plan of a terrace house is suitable for poor working classes. There are a number of tenements one above the other on the ground and first floors, with a bath and a w. c. or a privy common for two tenements. As each tenement is divided by a common wall from the neighbouring ones, it is not possible to arrange windows either for light or ventilation in the side walls. Hence it is possible to place them in the front and rear walls only.

The plan under reference consists of two rooms one

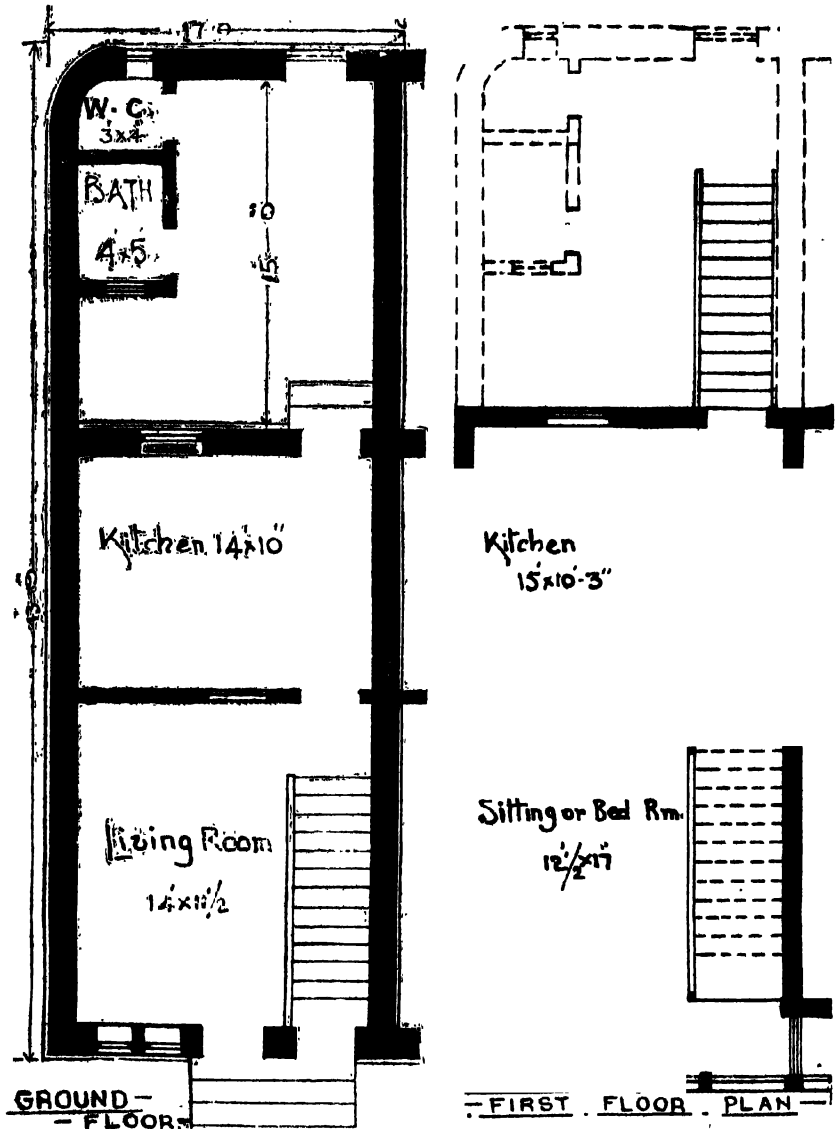


FIG. 174 and 175

of which is a kitchen $14' \times 10'$ and the other a living and bed room combined. For the upper tenement

there is a separate staircase on the front and also on the rear side to approach services. The staircase further restricts the floor space of the sitting room on the first floor. Hence to compensate for that the room floor is projected in the front supported on cantilever beams and the extra space

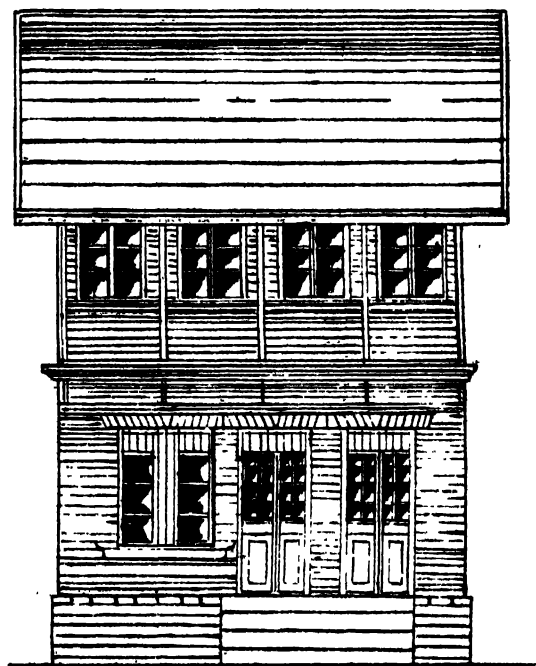


FIG. 176

FRONT ELEVATION.

Scale - 8-1.

thus obtained is incorporated into the room. As the side walls are thick it is possible to provide any number of cupboard accommodation which cannot be too much emphasized in such tenements of restricted floor space. The plinth area of each tenement is 430 sq. ft. and its cost roughly Rs. 1800.

Floor Area 880] PLAN No. 58 [Cost Rs. 3500

This plan is on the same system of terrace



FIG. 177

Presented by
SARAT CHANDRA MUKERJEE
FOUND. 1) (New No. 1/2)
Narendranath Mukerjee Road
P.O. Bally, Dist. Howrah (W.B.)

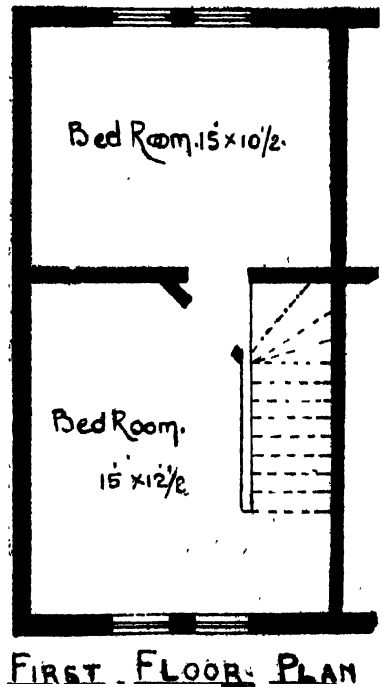


FIG. 178

houses but provides accommodation on a more liberal scale viz. a kitchen and a sitting room on the ground floor and two bed rooms on the first. There are a bath and a w. c. or privy provided in the rear yard. Light and ventilation are derived just as in the previous plan through windows in the front



° FRONT ELEVATION: °

: Scale: -8'-1":

FIG. 179

and rear only. A window or two if provided near the ceiling in the middle cross partition wall in all such terrace houses will ensure a through ventilation. The staircase has an independent access. The Floor area of the house is 880 sq. ft. and the cost is Rs. 3500.

Floor Area 800] PLAN No. 59 [Cost Rs. 3500

This plan provides almost the same accommodation as the previous one does, but has got an

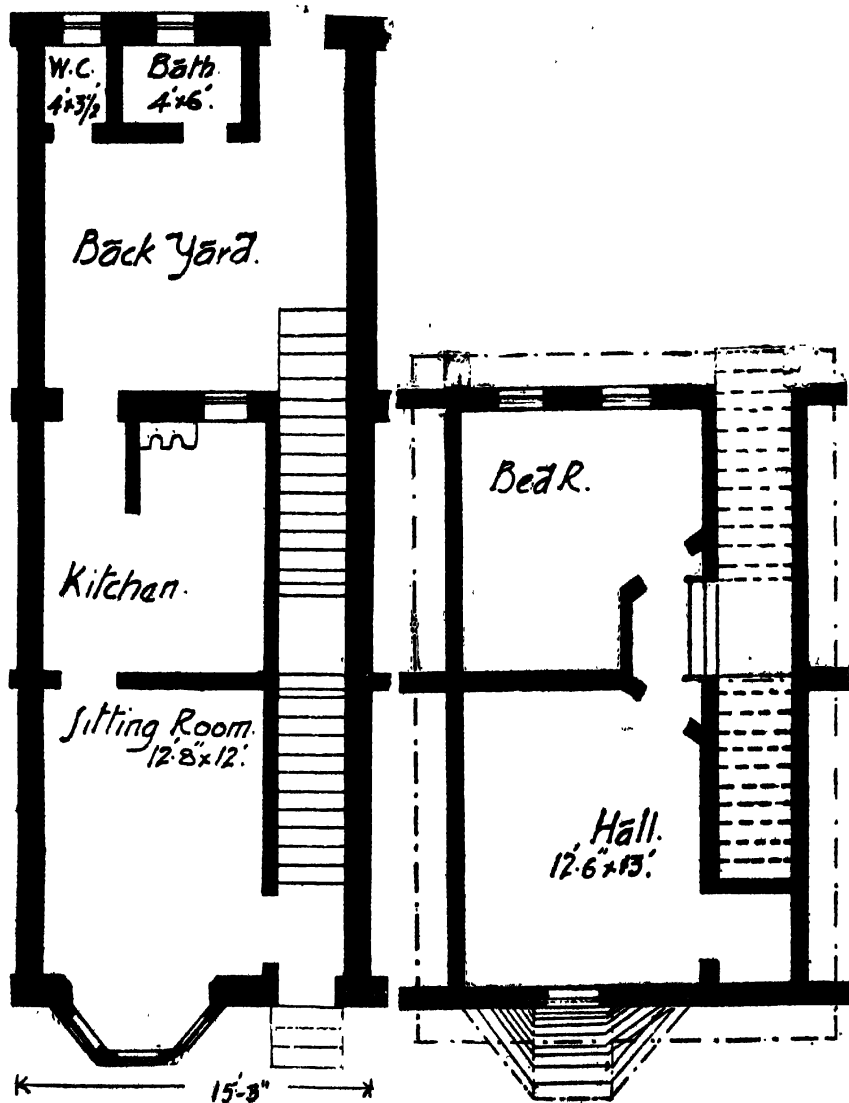
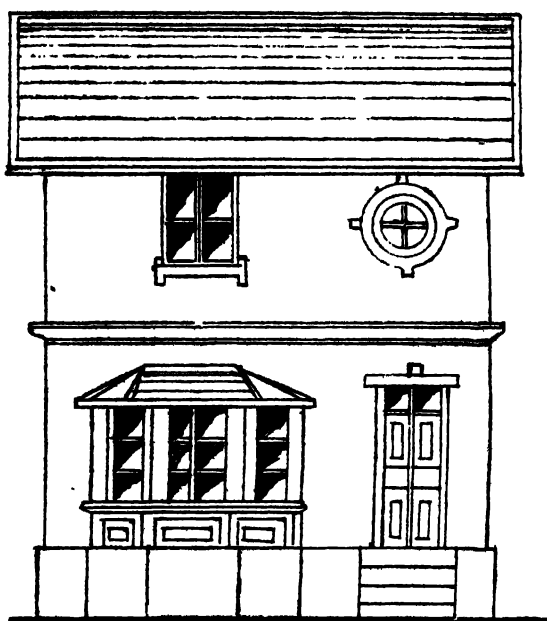


FIG. 180 and 181

independent additional staircase to go to the bath and w. c. from the bed rooms on the upper floor. The w. c. unless screened by some partition would be exposed to view from the kitchen. In this respect the arrangement in the previous two plans



° FRONT ELEVATION.

FIG. 182

is better. The front appearance is slightly improved by projecting the semi-hexagonal bay window and constructing a detached roof over the bay portion. The Floor area of each tenement is about 800 sq. ft., and the cost of both floors about Rs. 3500.

Floor Area 1000] PLAN No. 60 [Cost Rs. 4250

This terrace house provides one additional room on each floor than the previous plan.

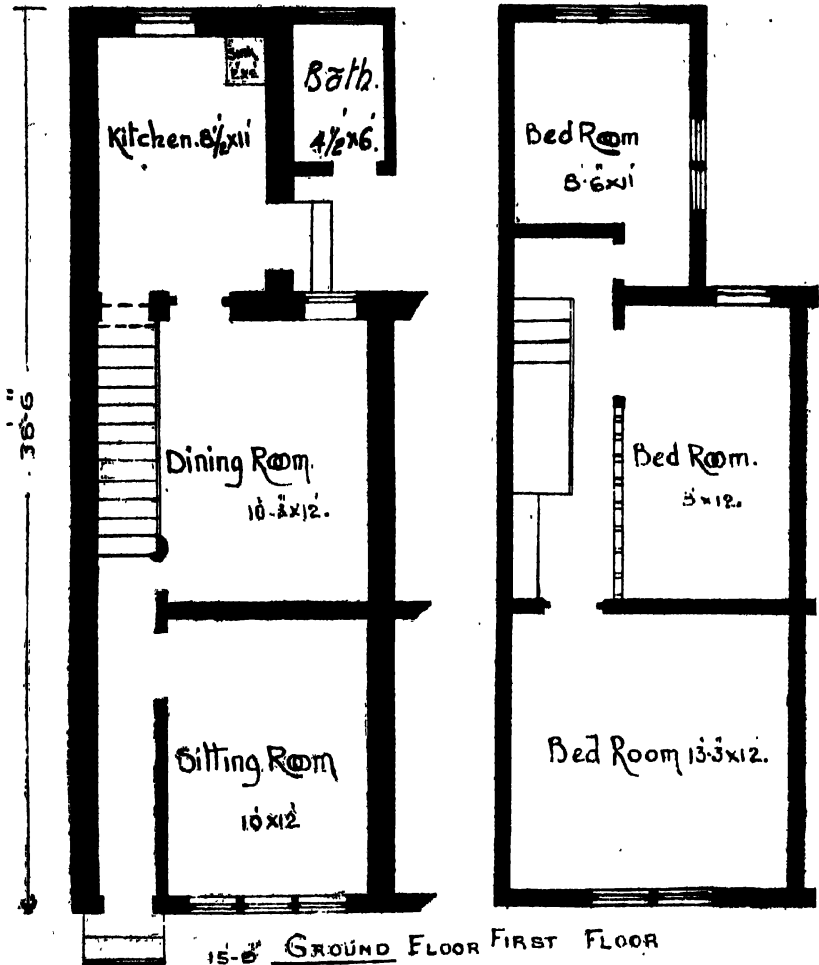
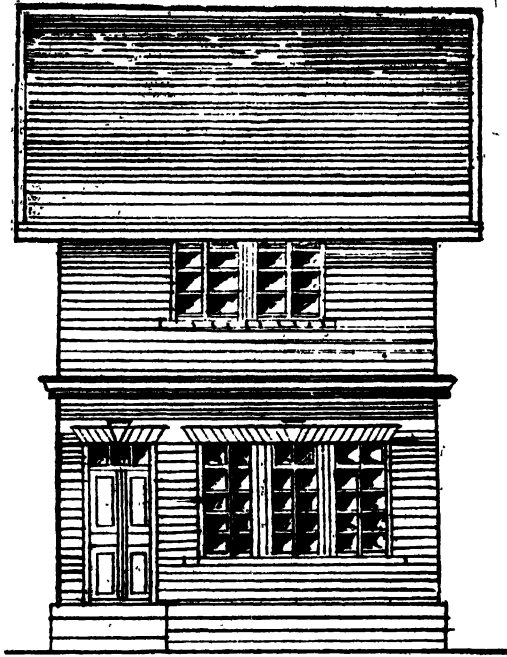


FIG. 183 and 184

Besides every room has a separate entrance to it. The kitchen is made specially narrow to leave room for a window for lighting the

dining room. The bath room is near the kitchen, attached to it on the outside. The Floor



:FRONT ELEVATION:

:Scale. 8' = 1":

FIG. 185

area is about 1000 sq. ft. and the cost of each tenement of two floors Rs. 4250.

Floor Area 1030] PLAN No. 61 [Cost Rs. 4500

This plan is a further improvement on the previous one in-as-much as it provides one more small room called study room in the

parts of a town or city there are long and narrow sites with houses closely attached to each other, hence light and ventilation are possible only from the front or the rear side. In the present plan the

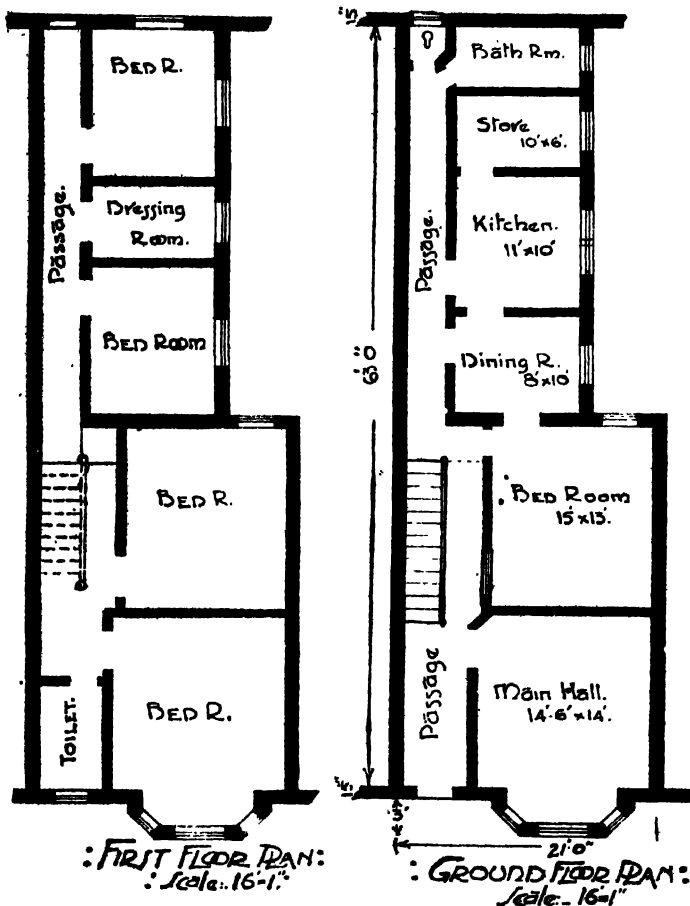


FIG. 189 and 190

main hall in the front has got 3 windows in the bay portion, but in order to light the bed room behind it the remaining part of the house had to be set back for providing a space for a window. The

staircase is purposely located at a distance from



FIG. 191

the front entrance, so that any person going up may be under gaze from the main hall. Behind the bed room are situated all the necessary apartments usually required including even a w. c. The latter should be built only in places where underground drainage has been constructed. On the first floor 4 bed rooms, one toilet and one dressing room are provided. The front two rooms are accessible after climbing two more steps above the floor of the rear portion. Fig. 191 shows an elevation. The Floor area is 2440 and the cost Rs. 10000.

Floor Area 2400] PLAN No. 63 [Cost Rs. 10500

Very often the front rooms on the ground floor of terrace houses situated in busy parts of a town are very much in demand for being hired for shop purposes. The plan shown in Figs 192 & 193, is the same as the previous one but modified to suit the altered conditions. The bay window has been removed to present a maximum width for a show room. The room behind the latter is meant to be a go-down with a number of shelves. A separate bath and a w.c. are provided for the use of the tenant keeping the shop, behind the godown and all the apartments behind them are intended to be used by a family. Upstairs are four bed rooms and a toilet room. A projecting 3 ft gallery is constructed on

the upper floor. An additional flight of stairs for

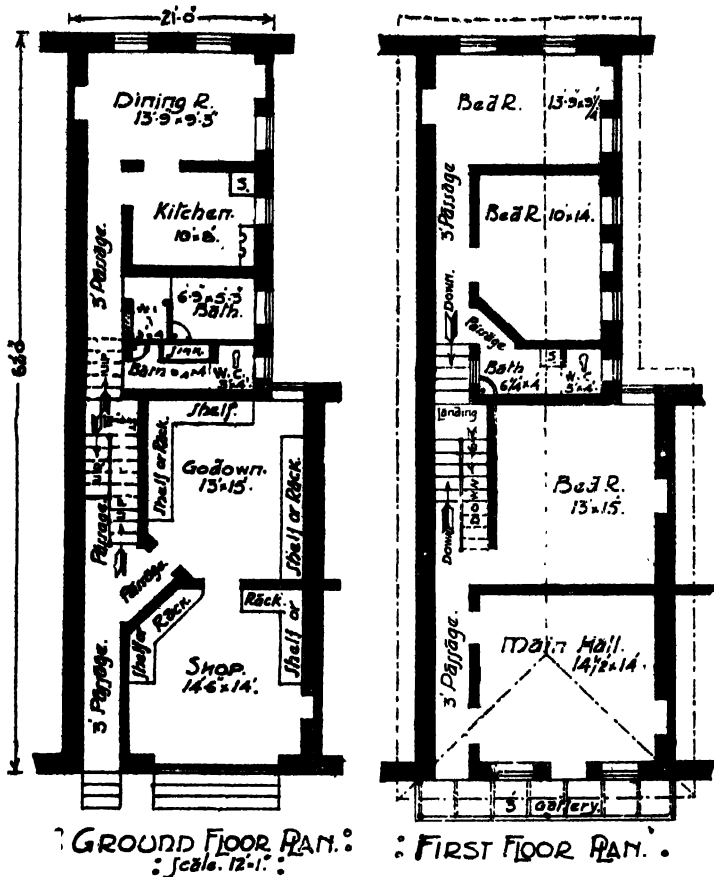


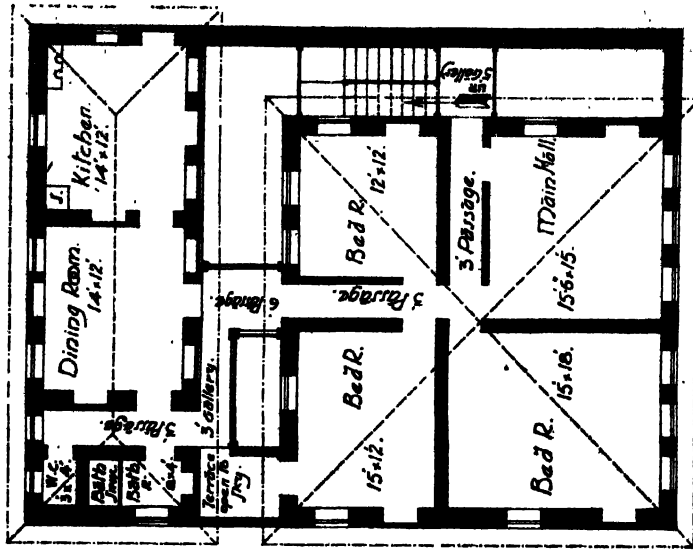
FIG. 192 and 193

going up from the inner apartments up to the first landing is a special convenience. The Floor area is 2400 and the cost Rs. 10500.

Floor Area 2790] PLAN No. 64 [Cost Rs. 12700

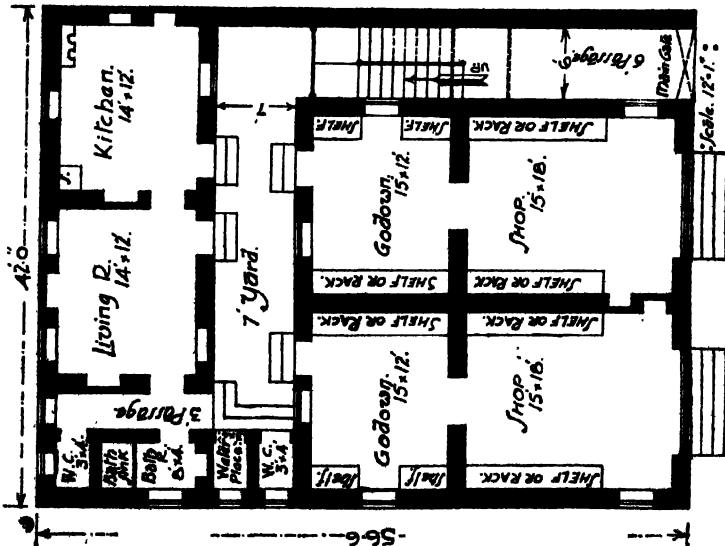
This is another plan with a shop front. There is a row of two shops behind which a go-down is provided. An open yard behind the godowns separates the shops from the residential block.

There is a separate entrance for the latter on the right hand side. On the first floor there is a self-contained



• FIRST FLOOR PLAN :

FIG. 195



• GROUND FLOOR PLAN :

FIG. 194

separate flat with four bed rooms connected to the

kitchen and dining room block by a bridged passage. The small tenement of a living room and a kitchen on the ground floor can be rented out



: FRONT ELEVATION. :

FIG. 196

separately. Fig. 196 shows its elevation. The Floor area is 2790 and the cost Rs. 12700.

Floor Area 1180] PLAN No. 65 [Cost Rs. 5100

This design of a cottage is suitable for terrace houses in towns or cities where sites with a wide frontage but small depths are sometimes available. On the ground floor are situated a kitchen, bath, dining and a drawing room with a staircase opening near the entrance. As the house is supposed to be attached to the neighbouring ones, it is not possible to keep windows in the side walls. Hence they are kept in the front and rear walls. For this purpose instead of extending the side walls rights on the rear side, sufficient room has been left on both sides for windows, and the kitchen and bath built. On the

first floor there are three bed rooms and in the

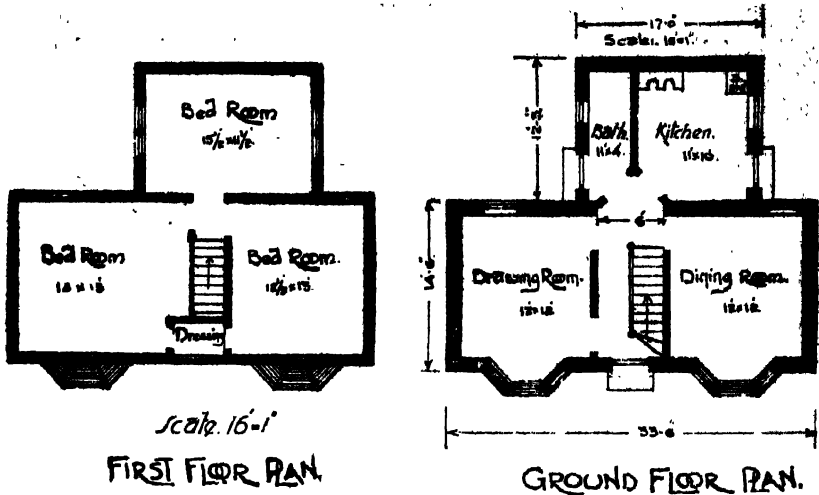
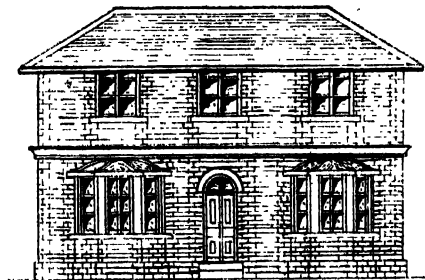


FIG. 197 and 198

space just above the entrance of staircase a small dressing room common to two front bed rooms is



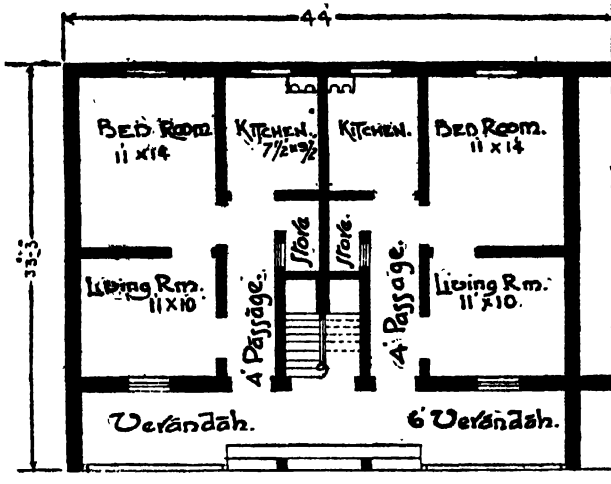
Scale 16'-1"

FRONT ELEVATION.

arranged. The bed rooms, particularly the one in the rear, are excellent in respect of ventilation. The Floor area of the house is 1180 sq. ft. and the cost is Rs. 5100.

Floor Area 745] PLAN No. 66 [Cost Rs. 3000

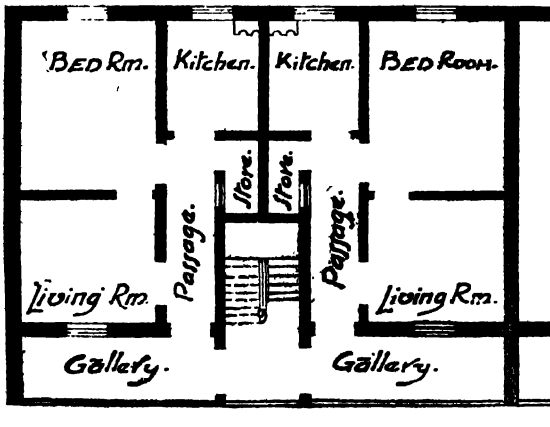
This is a building designed on the flat system with a verandah, two living rooms and a kitchen in



GROUND FLOOR PLAN.
Scale: 16' 1".

FIG. 200

each tenement. The provision of a 4 ft. passage



FIRST FLOOR PLAN.
Scale: 16' 1".

FIG.

makes every room almost independent. The space

below the staircase landing can be used as a bath room for which there is no separate provision. There is a staircase in two flights parallel to each other in the centre common to two tenements. On the first floor the same arrangement as on the ground floor, prevails. The 6 ft. wide verandah on

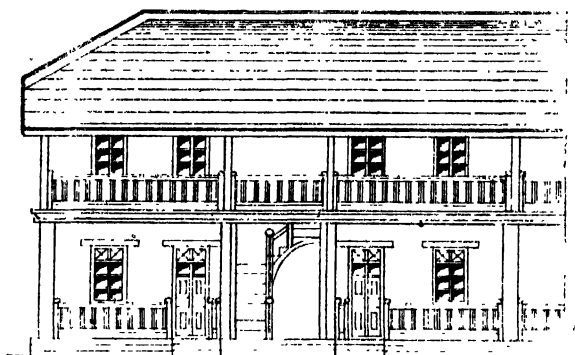


FIG. 202

the front side makes a very good sitting out place and is also useful for sleeping when there are a few casual visitors. Thus it is more like a flat or a semi-detached house than a terrace. The Floor area of each tenement is 745 sq. ft. and its cost is Rs. 3000.

Floor Area 780] PLAN No. 67 [Cost Rs. 3500

This design is suitable for places where space is not so much restricted. Each tenement is quite

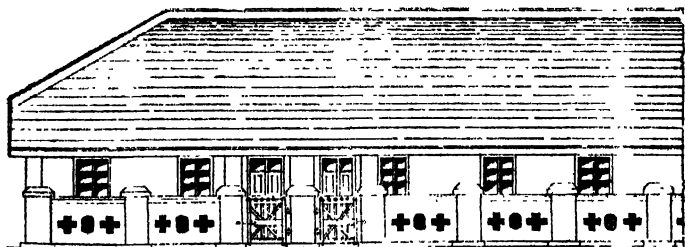
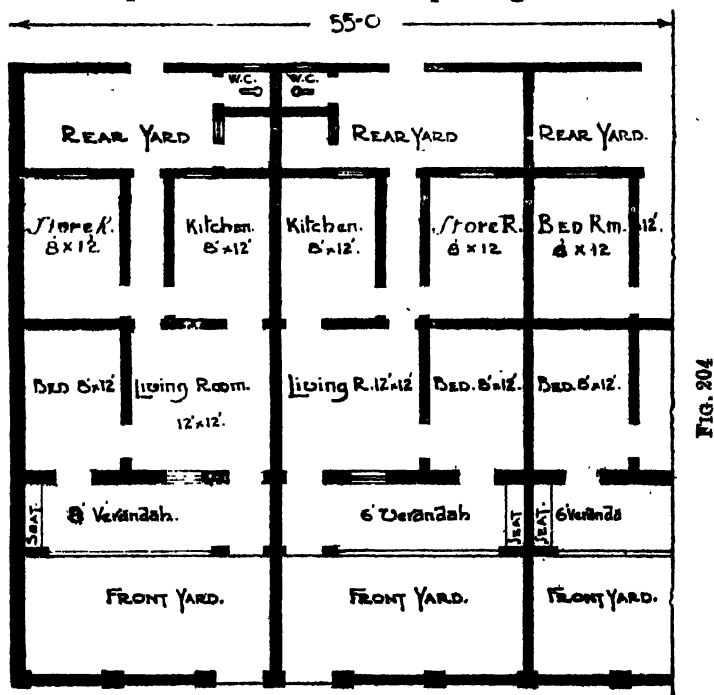


FIG. 203

independent of the neighbouring ones separated

from them by a blind wall even in the front and rear yard. It provides for a 6 ft. verandah in front, a kitchen, two living rooms and a store which can be occasionally turned into a bed-room also. There is a bath and a w. c. provided in the rear yard. The provision of a small passage maintains



: GROUND FLOOR PLAN :

: Scale: 1/16" = 1' :

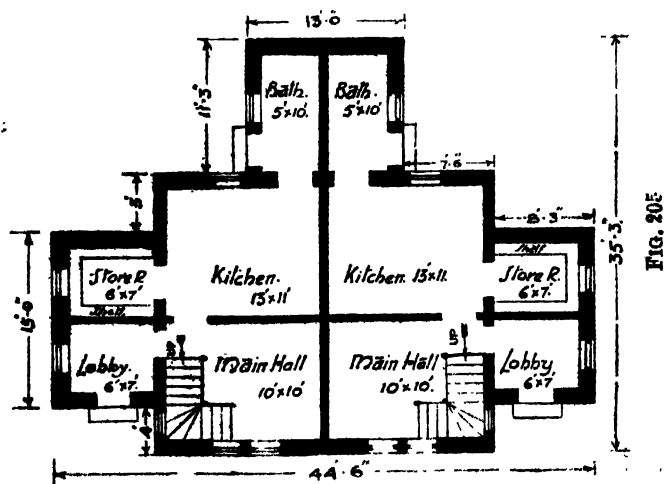
the privacy of every room and gives an independent access to services. Thus it embodies on a small scale all the conveniences which a middle class family demands. The Floor area of each tenement is 780 sq. ft. and with the bath and w. c. which are over and above this, it would cost 3500 Rs. The structure consists of a ground floor only.

FLATS OR SEMI-DETACHED HOUSES

This type of houses differs from the terrace houses in this that in the latter any number of tenements could be built in a row whereas in the type of semi-detached houses only two tenements are built with a common wall between. In consequence of this, light and ventilation can be enjoyed in three directions instead of only two in terraces. These are therefore mid-way between independent cottages and terraces. Flats have one disadvantage viz. the grouping of rooms cannot be made with respect to the direction of the sun and breeze. Thus while one tenement gets the maximum advantage the other close to it derives none at all.

Floor Area 1955] PLAN No. 68 [Cost Rs. 8400

The one shown in figs 205 to 208 contains two



such tenements having a kitchen, bath, a store room and a parlour on the ground floor and three

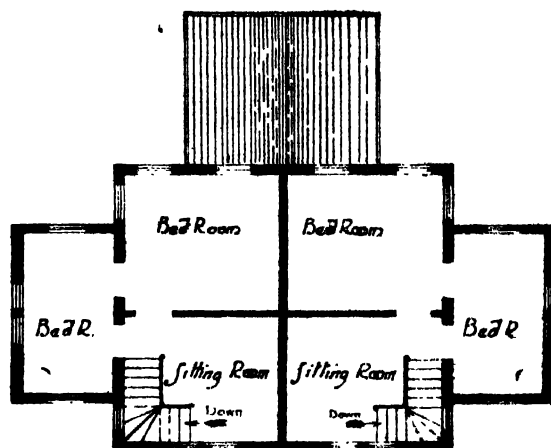
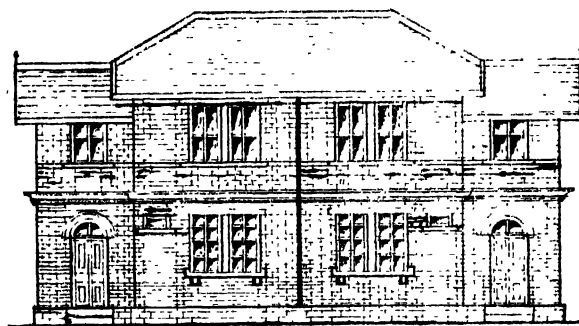


FIG. 206

:FIRST FLOOR PLAN:

bed rooms on the upper. The main entrance is on



:FRONT ELEVATION:

FIG. 207

a side where a small vestibule 6' x 7' is provided. The parlour is a small room 13' x 10', some part of

which is, again, occupied by the staircase. The kitchen is a fairly good sized room. There is a



:SIDE ELEVATION:

FIG. 208

back exit through the bath room. The Floor area is 1955 and cost of both the tenements Rs. 8400.

Floor Area 3240] PLAN No. 69 [Cost Rs. 13000

These flats consist of a kitchen, two living or



FRONT ELEVATION.

Scale 16'-1."

FIG. 209

bed rooms and a verandah. The latter is a very

useful adjunct. There is no separate dining room. The small verandah on the rear side might prove useful for a grinding stone or a pounding pestle. There is a small store room behind the living room, the space below the staircase landing could also be used in addition for the purpose. The w.c. and bath are cut off by a small passage. Ample provision for cupboards has been made. The central staircase

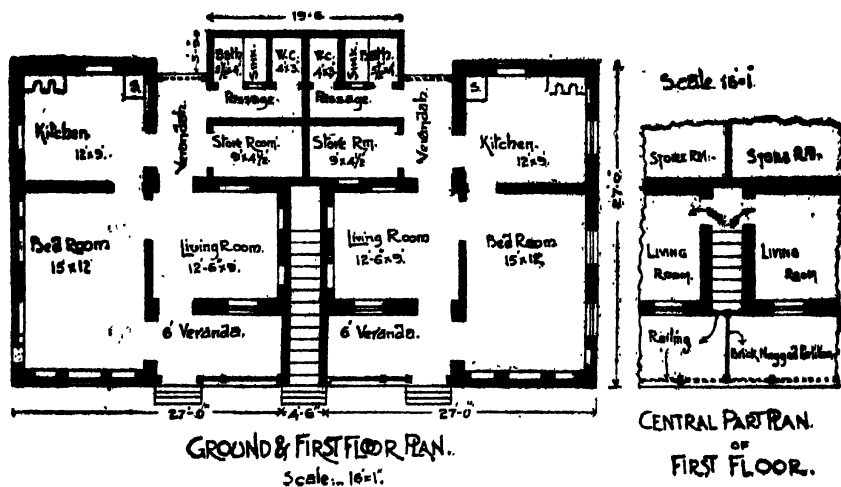


FIG. 210 and 211

for access to the upper flats is cut off from the lower ones by blind walls. The staircase is in one straight flight and opens into living rooms which becomes in consequence a passage. This is a blemish to the design. Fig 211 shows part plan of the landing upstairs. The Floor area is 3240 sq. ft and the cost is 13000 Rs. of two floors, the abstract of which is given on the next page ;—

	Rs.
Excavation for, and concrete in foundation	385
Plinth, stone in lime masonry	637
Super-structure burnt brick in lime 1½ brick	2000
Do. 9" thick partition walls	850
Doors panelled	1323
Windows	1232
Cupboards	720
Plaster with white and colour washing	1352
Flooring	1250
Paving	613
Roof	1300
Staircase	150
W. c. s. and sanitary fittings	575
Finishing, railing, steps, sinks	500

Total ... 12787

Say roughly 13000 Rs.

Floor Area 3240] PLAN No. 70 [Cost Rs. 14000

This is an improvement on the previous design of flats. In this all the rooms are of bigger size

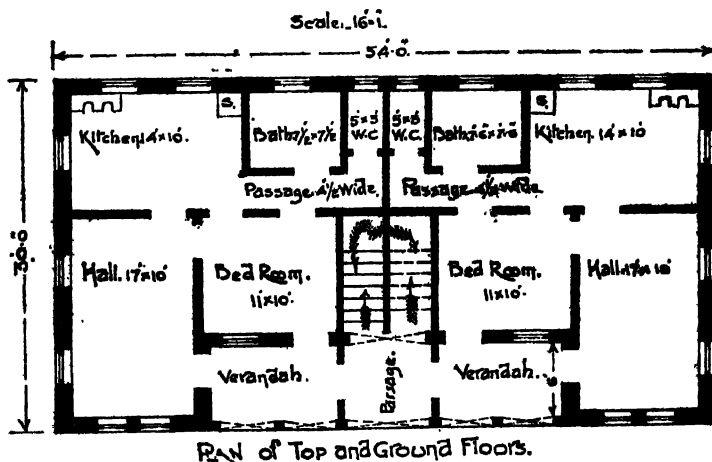


FIG. 212

but the back verandah which is a great con-

venience is omitted. The kitchen is sufficiently big to accommodate a few seats for dining also. In places where drainage is not constructed on water-carriage system a passage and exit door for going to privy may be provided in the space occupied by w. c. The space below the flights of stair could be utilised as a store room. The staircase being in two flights, the topmost landing is in the front gallery which gives an independent access to all the rooms.

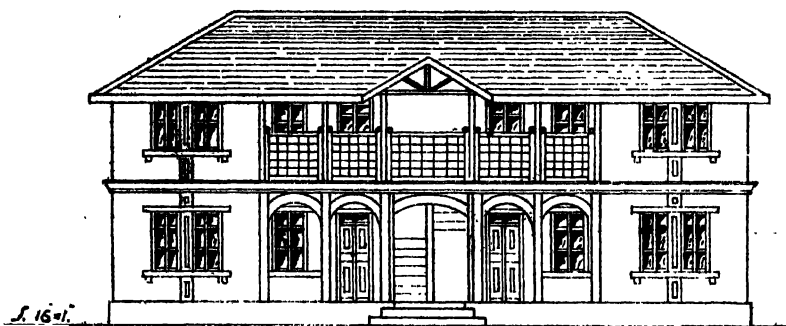


FIG. 213

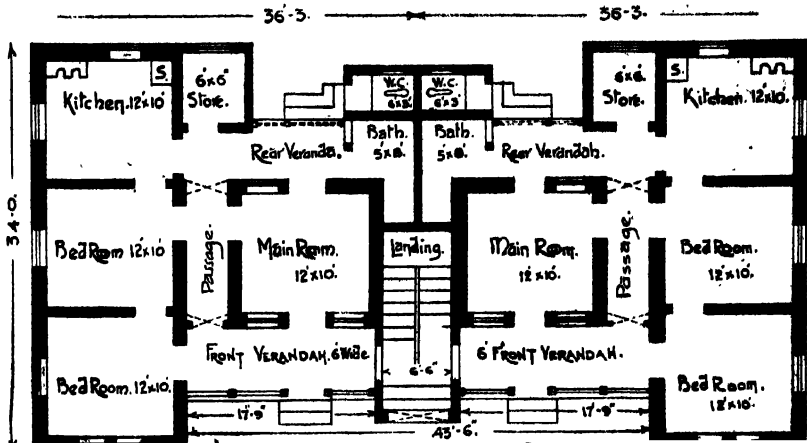
FRONT ELEVATION.

This is a very economical design in which every inch of space is turned to the best account. Such buildings are actually built in Bombay and have been found by the experience of tenants to be very convenient. The Floor area is 3240 sq. ft. The cost of the four flats, two on each floor is Rs. 14000.

Floor Area 4628] PLAN No. 71 [Cost Rs. 20,000

The flats represented in the plans shown in figs. 214 and 215 are a further improvement on the previous ones. They provide a decent accommodation for a higher middle class family. There are verandahs on the front and the rear. The latter is

sure to be very much appreciated by ladies. The bath room is situated at a convenient place. There is room below the flight of staircase for storing



GROUND & FIRST FLOOR PLAN.

Scale 16'-1".

FIG. 214

fuel, which is attached to the bath room. The entrance to w. c. is quite cut off. In addition to



Scale, 16'-1".

FRONT ELEVATION.

FIG. 215

kitchen there are three living rooms; the provision of a small lobby helps to preserve the privacy of

every bed room. There is also a small store room quite close to the kitchen. Thus the flats contain all the necessary apartments required by a family for a decent living and the grouping of rooms in particular is excellent. The Floor area is 4628 sq. ft. and the cost 20,000 Rs. for the four flats.

Floor Area 5168] PLAN No. 72 [Cost Rs. 22000

In this design of flats passage or lobby is altogether omitted for the sake of economy of space

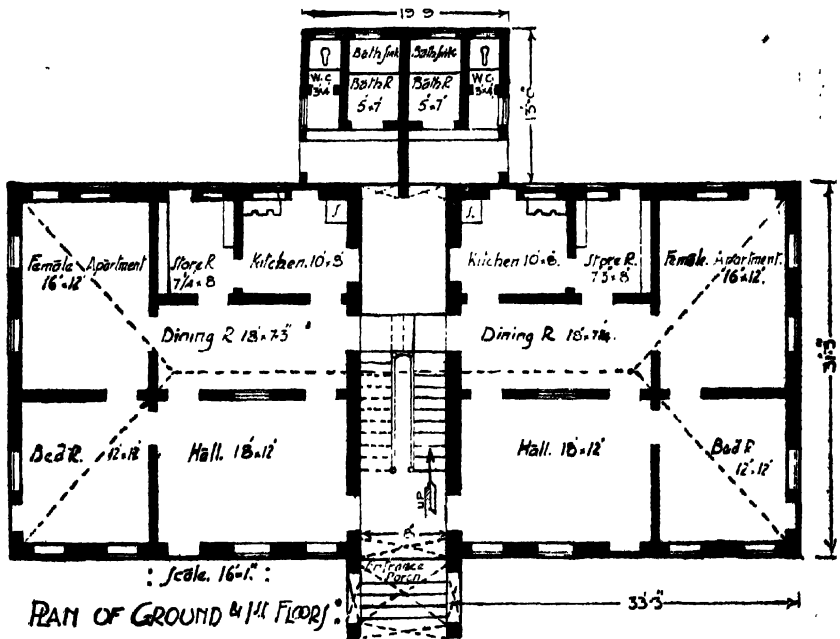
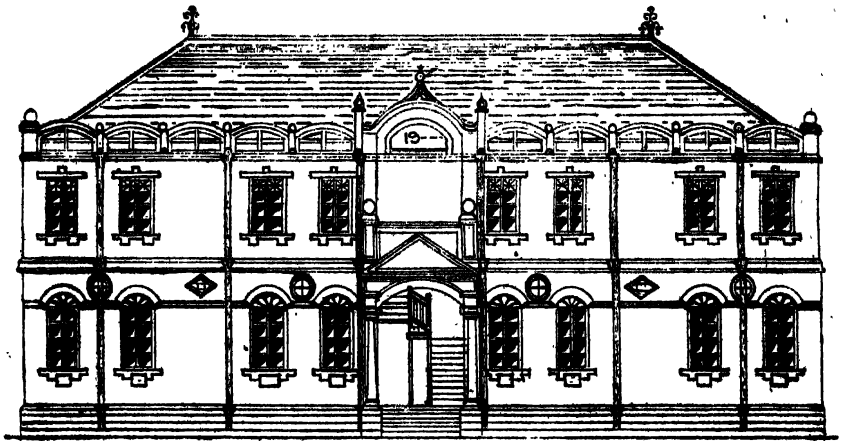


FIG. 216

This has resulted in giving one more room. For entering the dining room or kitchen from outside the passage below the left hand flight of staircase and landing can be used. All the rooms are of much bigger size. The kitchen is no doubt a small one, but

the provision of a separate store room and a dining place attached to it more than counterbalances it. The block of bath and w. c. is quite cut off but connected to the main building by a passage. The Floor area is 5168 sq. ft. including that of the



: FRONT ELEVATION.:

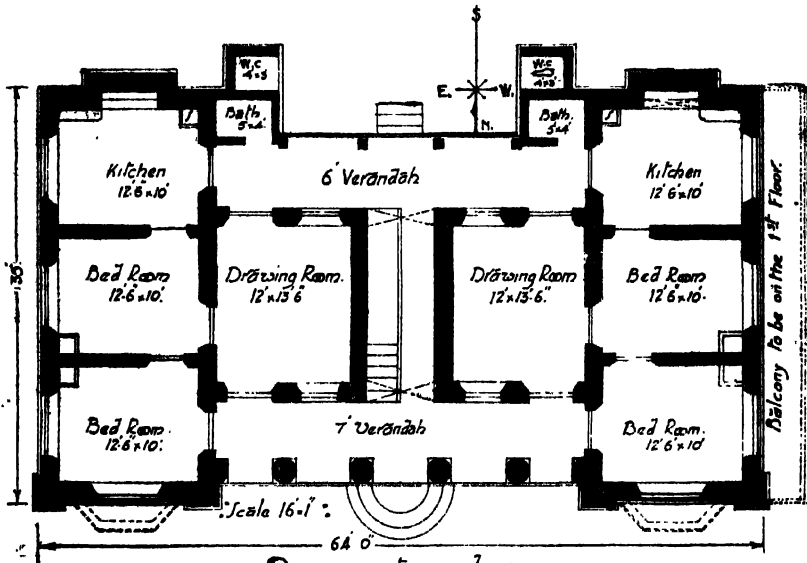
FIG. 217

bath and w. c. block and the cost is 22000 Rs. An addition of a 6 ft. verandah in front of the main hall, which would make the front bed room 18' x 12', though will increase the cost, is sure to make the flats really enviable.

Floor Area 4475] PLAN No. 73 [Cost Rs. 19000

This is a building designed on the flat system for accommodating two tenants on each floor and is actually built. Every inch of the space is utilised. In the present design a minimum accommodation required for a middle class family viz. of a kitchen, two bed rooms and a drawing room, is provided. A smoke outlet is provided in the projecting part of the kitchen. If light

partitions are erected across verandahs in line with



: PLAN OF 1st AND 2nd FLOORS :

FIG. 218

the outer walls of the drawing room with a door



: FRONT ELEVATION :

FIG. 219

with springed hinges, the front verandah becomes

a useful sitting room and the rear one a small dining place. There are projecting balconies provided in front of the windows on the front side and a projecting gallery on the West side. The Floor area of 4 flats is 4475 sq. ft. and the cost 19,000 Rs. The rooms on the 2nd floor if built would cost extra.

Floor Area 3125] PLAN No. 74 [Cost Rs. 14000

The plan shown in figs. 220 to 223 has got a special advantage viz. it admits of being divided into four or two tenements and therefore could be

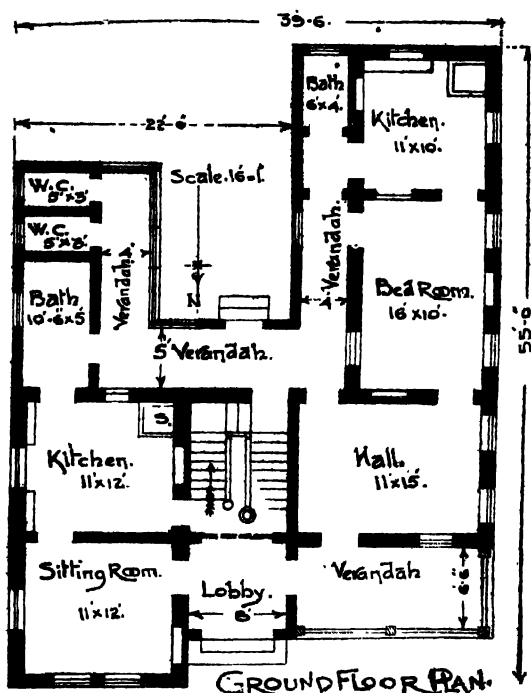


FIG. 220

let to two, three or four families or both the floors can be used by a single family. Thus on each floor there are two flats—one of two rooms,

bath and w. c. on the left hand side, and another

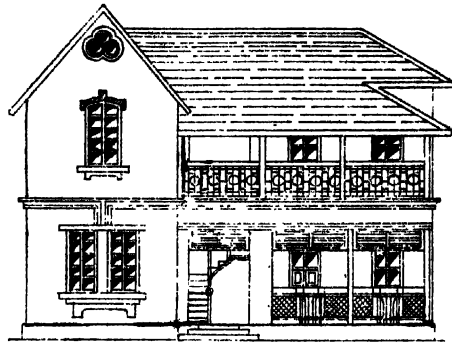


FIG. 221

FRONT ELEVATION
Scale. 16-1.

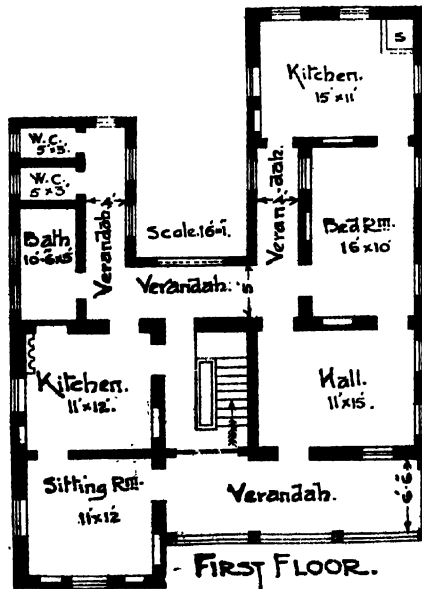
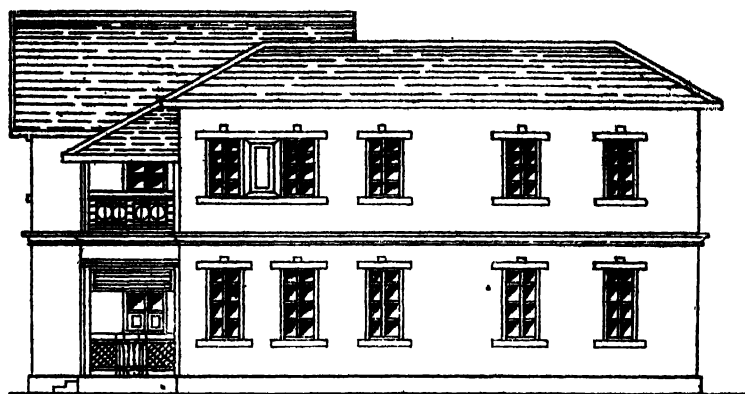


FIG. 222

of 3 rooms and a verandah on the right. The building is shown to face the North. If the whole floor

is to be used by one family only the rooms on the left hand side would better serve as a kitchen and dining room and all on the right hand side which get the Western aspect would be bed rooms



SIDE ELEVATION.
Scale. 16'-1".

FIG. 223

Though convenient it is not an economical design as so much space is wasted in small verandahs and lobbies. Figs. 221 & 223 show the North and West elevations. The Floor area of both the storeys is 3125 sq. ft. and the cost is Rs. 13400.

Floor Area 3850] PLAN NO. 75 [Cost Rs. 16500

This is another plan designed on the same principle as the previous one suitable for either one big, or two, three or even four small families. This is actually built in the Saraswat Colony, Poona, facing North. If it is to be used by four families the arrangement shown in the ground floor in fig. 224 is to be followed, if to be divided into two tenements,

the one shown on the first floor plan fig. 226 is to

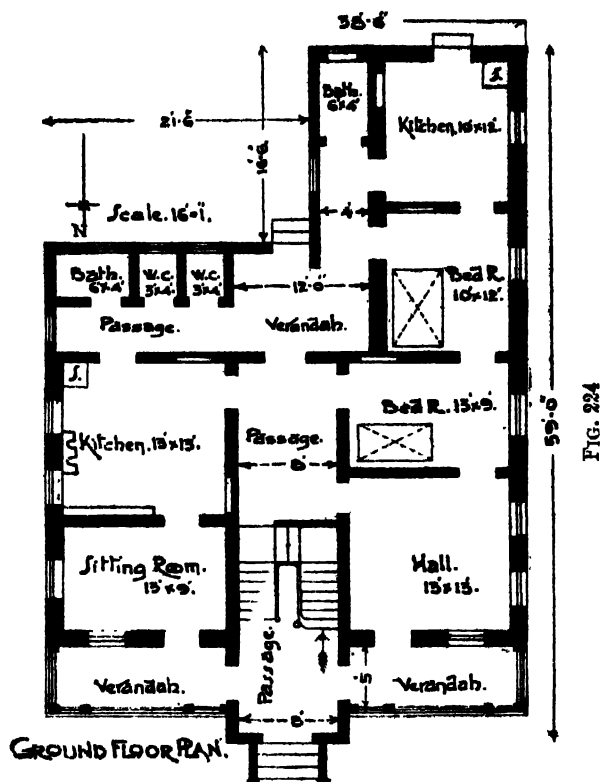


FIG. 225

be adopted. It is an improvement on the previous plan in as much as greater economy of space is made and though the rooms are a bit smaller (which is a drawback) one more room is added to

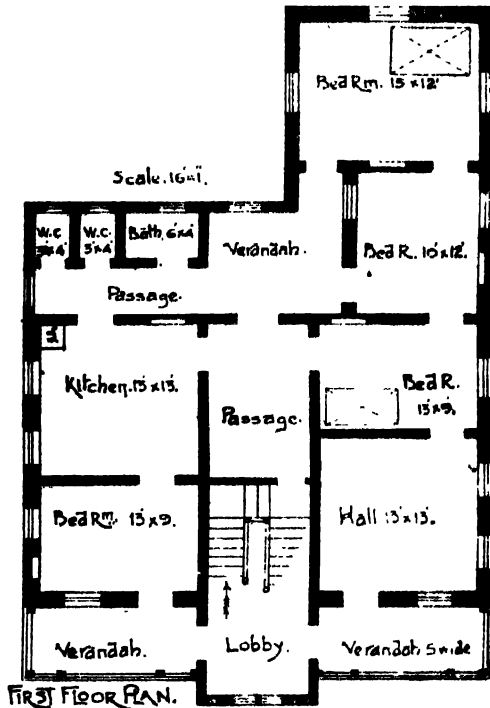


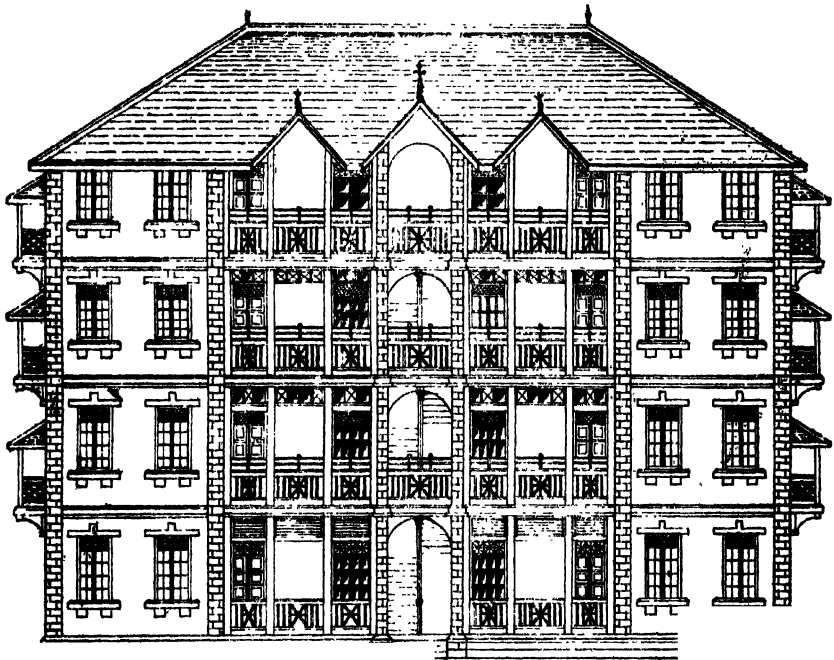
FIG. 226

the right hand tenement and the front verandah to the one on the left. The rectangular figures with dotted diagonals in bed rooms indicate the positions of beds. The Floor area of the whole building is 3850 sq. ft. and the cost, Rs 16500.

Floor Area 5250] PLAN No. 76 [Cost Rs. 24500

These flats are actually built and have been found by experience to be very convenient and

comfortable. They provide a decent accommodation for a higher middle class family. The sizes of all the rooms except kitchen are very good. A separate dining room partly counter-balances the smallness of the kitchen. The outer walls are thick and all inner ones light half brick partitions,



: FRONT ELEVATION. :

FIG. 227

the weight of the upper floors and roof being taken up by wooden posts in the partition walls. The staircase is very easy. In some flats a flight of stairs is provided on the space occupied by the small store room shown in plan, so that it serves as an exit for ladies to reach the lower landing of

the main staircase when they have to go out. The Plinth area of each floor is 2625 sq. ft. and a

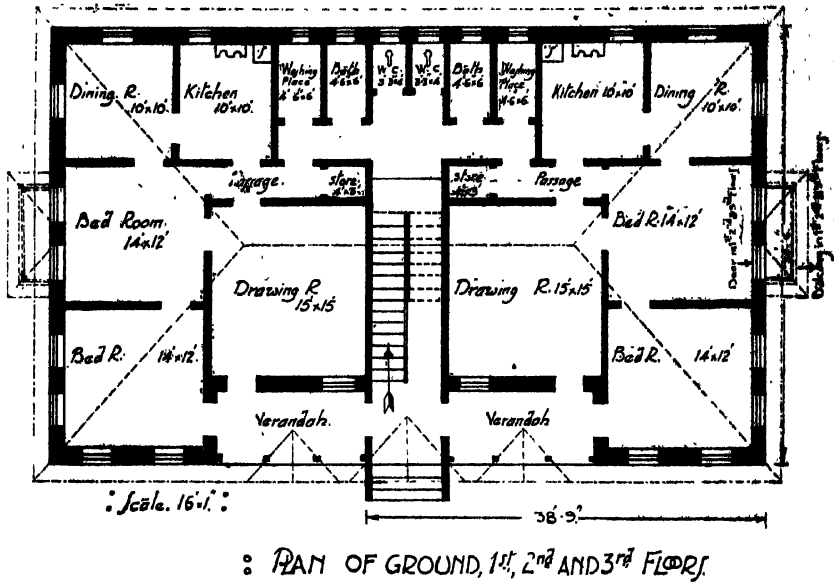


FIG. 228

two storied building having 4 flats would cost Rs. 24500

Floor Area 12500] PLAN No. 77 [Cost Rs. 58000

The flats represented in fig. 229 are comparatively very commodious and suitable for the richer class of people. The main common staircase is very easy. The front verandah 10' wide serves as a good sitting out place. There are two spacious bed rooms with a separate bath and dressing room attached to each. The dining room is 16' x 24'6" and the sitting room 20' x 17'6". The kitchen and store room block is separated by a verandah 10 ft. wide, adjoining which is placed a dispense room. There

is a small verandah on the rear side and a 3' 6" gallery with staircase for servants on both sides. The dotted double lines across rooms show the positions of rolled steel beams to support the floor.

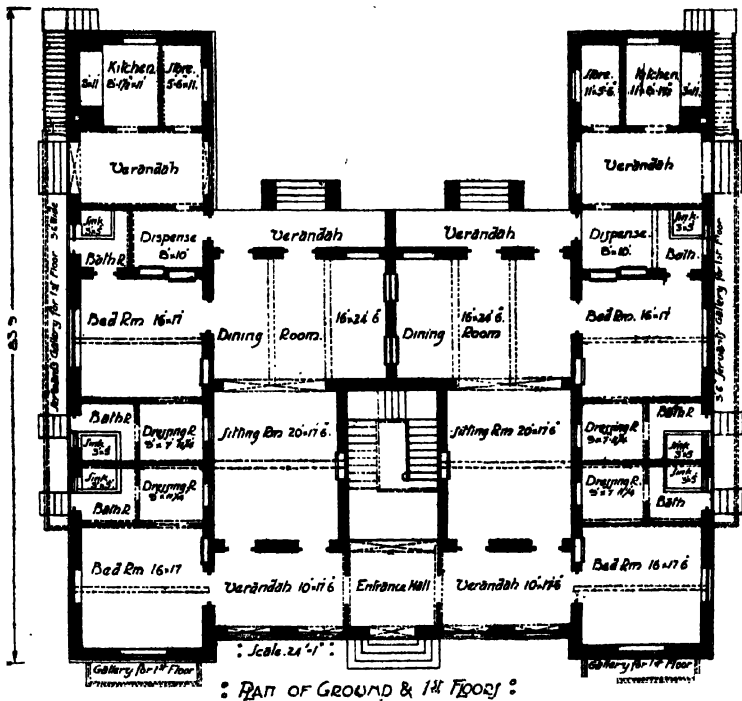


FIG. 229

The Floor area of a two storied building is 12800 sq. ft. and the cost would be about Rs. 58000

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 Narendra Nath Mukerjee
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P. B. Bally, Dist. 11

MANSIONS.

Floor Area 4100] PLAN No. 78* [Cost Rs. 21000

This is a plan of a house suitable for a West or East facing. There is a verandah 8 ft. wide in front. On the right hand side a decent guest room with a bath room attached to it is so placed that



: Scale 1/16" = 1' :

: FRONT ELEVATION :

FIG. 230

it is quite independent of other rooms of the house. A decent drawing room with a semi-hexagonal front is arranged in the centre and on the left hand side is placed a spacious dining hall. The kitchen is placed in a separate out-building connected to

* This and the following five plans are designed by *Mr. L. N. Sathé* Architect G. D. A. R. C. Bombay, by whose courtesy they are produced here. The elevations given are, however, quite different from his, except that of plan No. 79.

the main house by a covered passage. A small dispense room is placed behind the dining room from which food is served. The main staircase has an entrance in the front verandah and if necessary a small spiral staircase may be placed on the rear side for the use of servants. Upstairs two good

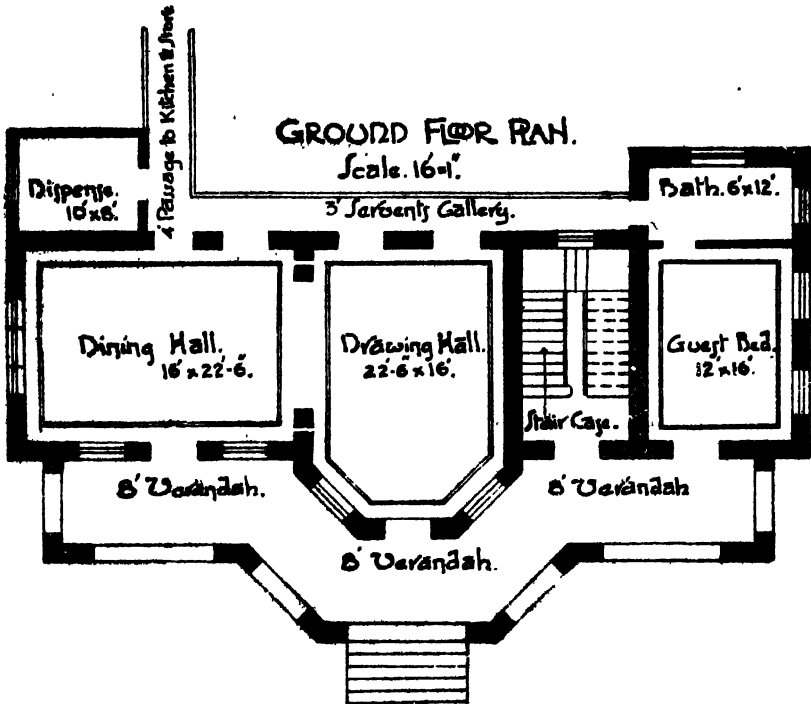


FIG. 231

sized bed rooms with bath rooms attached and a drawing hall with a front verandah and a servants' gallery are arranged. The roof over the verandah is detached and above it are kept clerestory windows which are seen in elevation. The floor area of the house is about 4100 sq. ft. and the cost Rs. 21,000.

The kitchen of this type of houses is generally

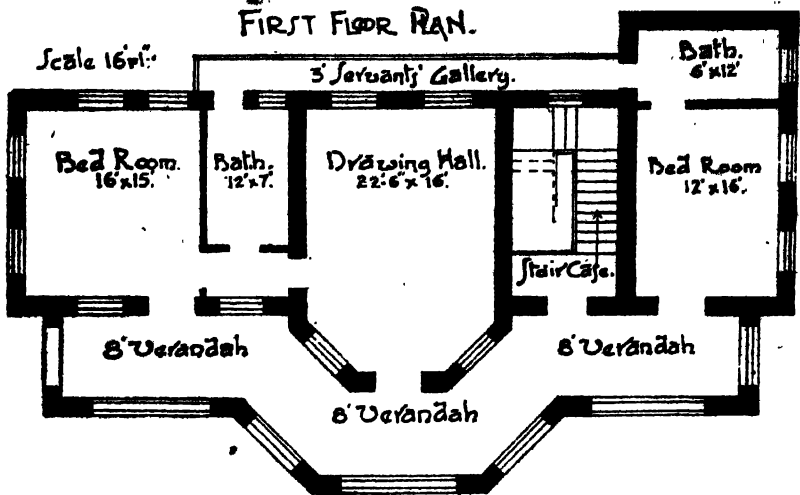


FIG. 232

detached from the main building in a separate block consisting of a kitchen, a store room and a verandah as shown in fig. 233. If the width of the verandah is 8 ft. or more it is very useful for dining purposes also for the Indian style of living.

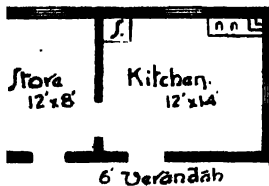


FIG. 233

Floor Area 2750] PLAN No. 79 [Cost Rs. 15500

This is a week-end cottage with an eight ft. verandah on three sides in the front, and two bed rooms with bath rooms attached and a combined drawing and dining room behind. A kitchen and store room block similar to the one shown in fig. 233 is built in a detached position connected to the main building by a passage covered with a roof. The staircase which has got only two straight

flights parallel to each other is placed near the dining room on the right hand side and, opposite it, is

GROUND FLOOR.
Scale. 16'-1.

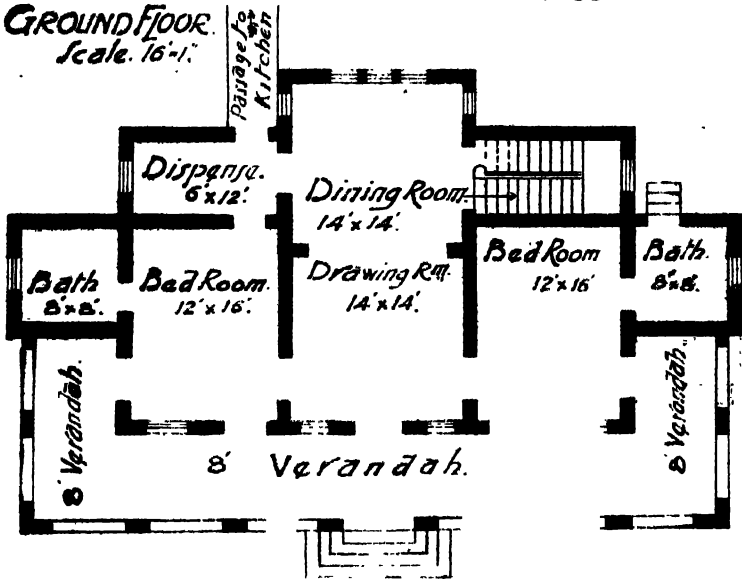
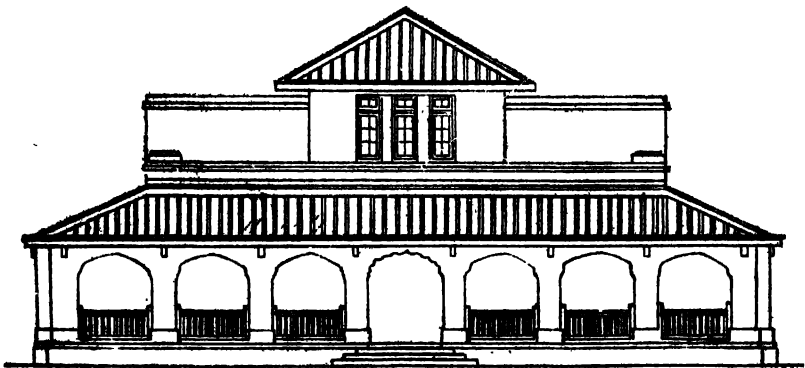


FIG. 234

placed a small dispense room. On the first floor there



FRONT ELEVATION.
Scale. 16'-1.

FIG. 235

is only one big bed room with a bath room attached

and a terraced roof on both sides. The Floor area

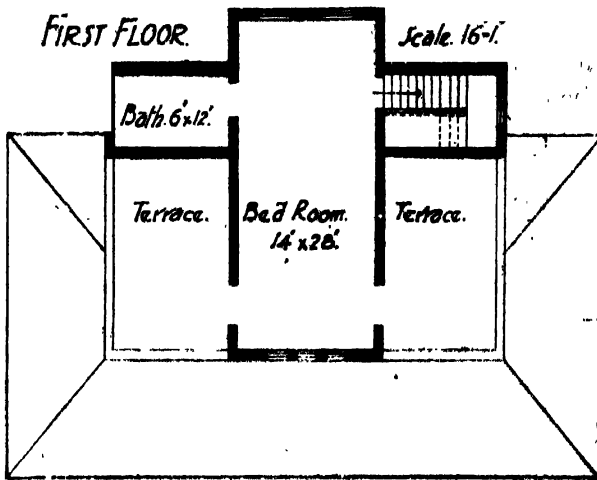
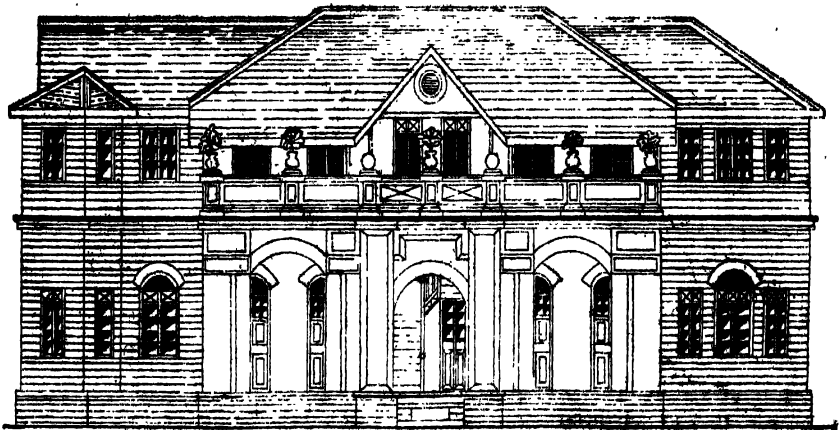


FIG. 286

of the house is 2750 sq. ft. and the cost Rs. 15500.

Floor Area 5280] PLAN No. 80 [Cost Rs. 28400

This is a plan of a very convenient house,



FRONT ELEVATION.

Scale 1/16"

FIG. 287

There is a porch at the entrance which is so very necessary for such mansions. The front verandah 8 ft. wide not only provides for a sitting out place, but also affords a separate entrance to every room. The dining room on the left hand side with a small

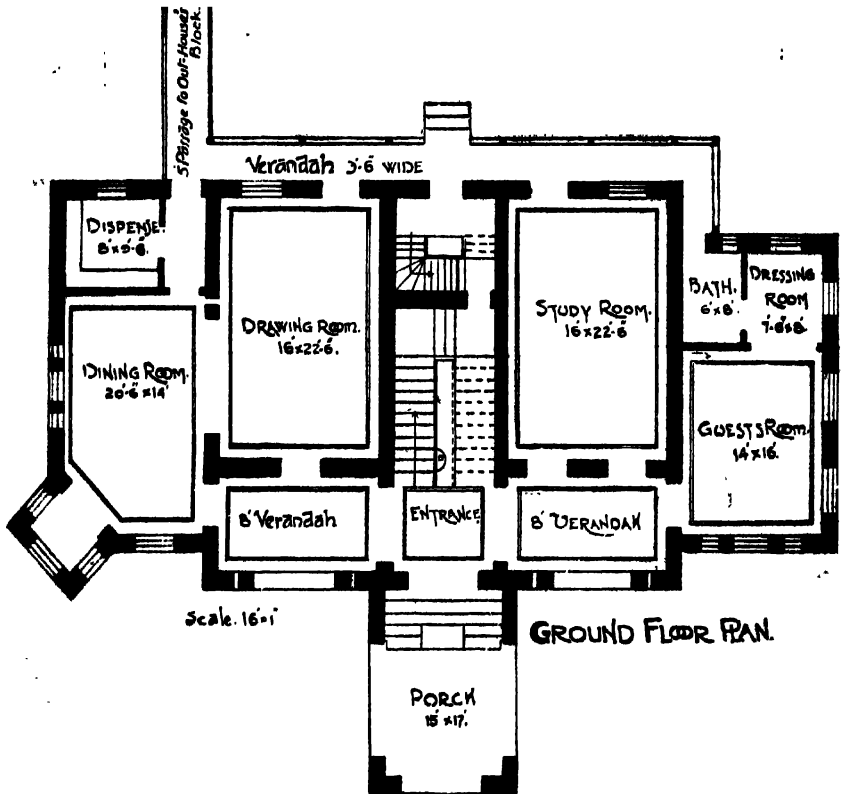


FIG. 238

dispense room attached to it and a covered passage connected to the kitchen block on the rear side is as best situated as could be desired. The size of the drawing room viz. 16' x 22' 6" is very good. The wide and easy staircase is centrally situated with another smaller one on the rear for servants.

The room called study in the plan would best serve the purpose of a 'Comfort Room.' The guest room with a dressing and bath attached to it would be an ideal one. The provision of the 3' 6" verandah on the back side makes every room independently approachable. Upstairs it is possible to place four bedrooms with bath rooms attached. The Floor area is 5280 sq. ft. and the cost Rs. 28400.

Floor Area 5740] PLAN No. 81 [Cost Rs. 31000

This is also a convenient plan of a house. There is a porch 12' x 16' in the front on the top of which a terraced roof is constructed. Behind it is placed an 8 ft. verandah with a small card room on the



FIG. 239

left and a guest room on the right. The latter is quite independent and has got a separate dressing and bath room of its own, approachable to a servant from the rear verandah. A spacious drawing room 20' 6" x 22' 6" is placed in the centre

and the main staircase placed in it. On its left hand side a decent sized dining room with a small dispense room and a covered passage towards the kitchen block and 3' 6" servants passage on the

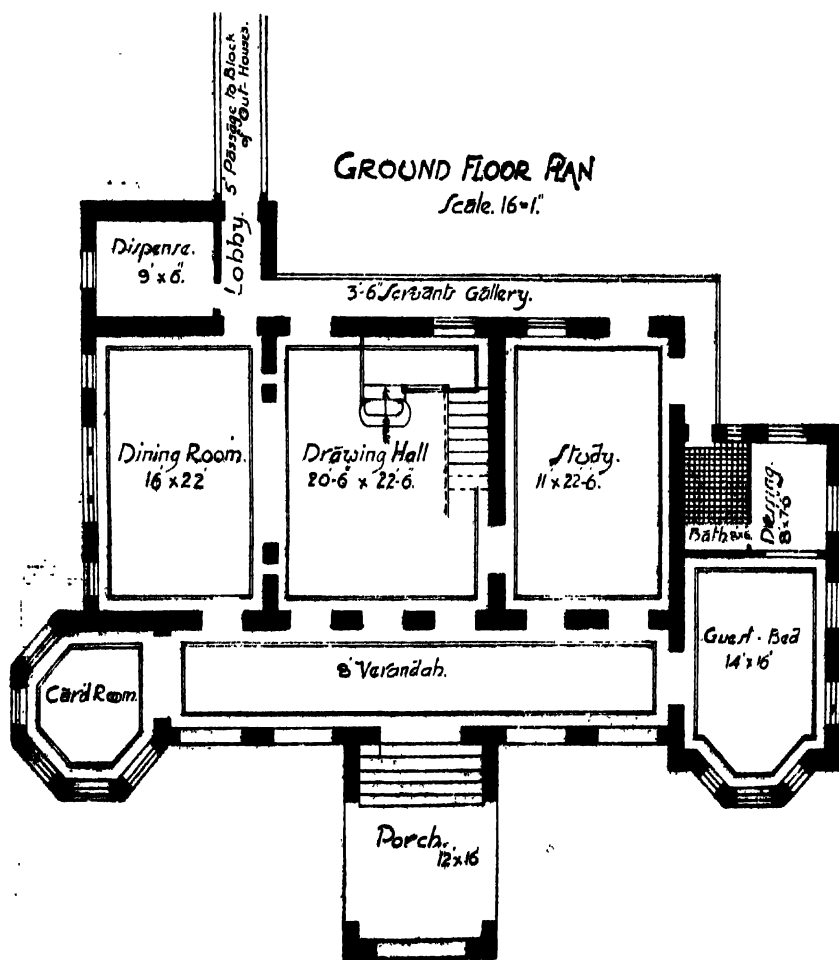


FIG. 240

rear side make the house very convenient. On special ceremonial occasions one big room can be made out of the dining and drawing rooms as

as there is no solid wall between them. On the right hand side the study room of $16' \times 22'$ is symmetrically situated. On the first floor bed rooms may be built as desired. The Floor area of the house is 5740 sq. ft. and the house would cost Rs. 31,000 to build.

Floor Area 5925] PLAN No. 82 [Cost Rs. 32200

This plan provides for a verandah in the front on

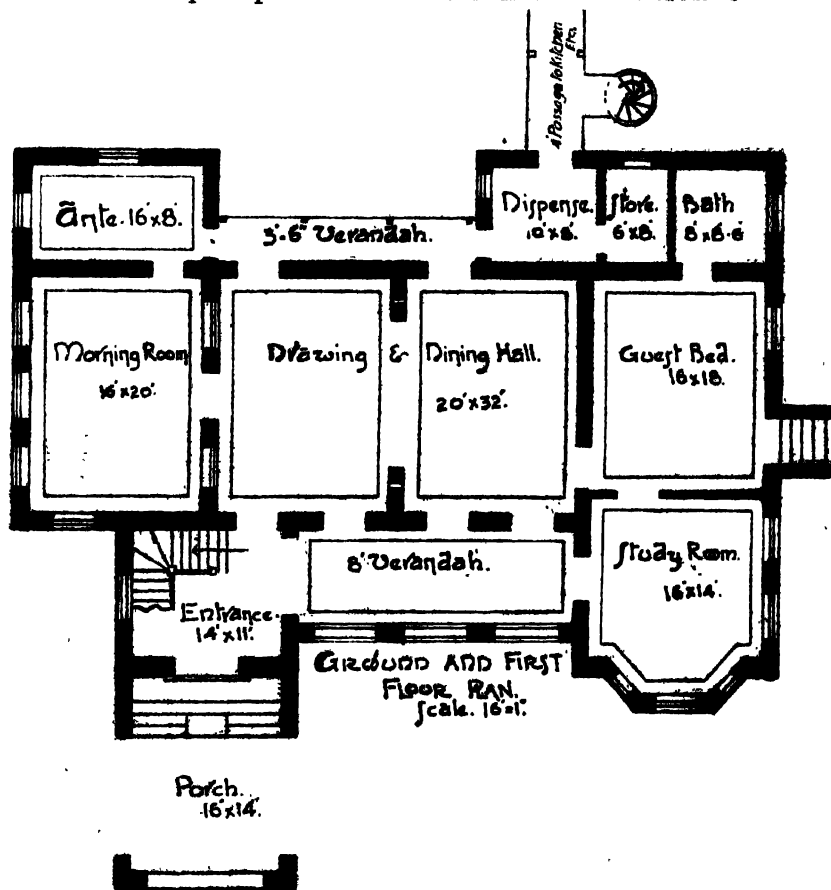
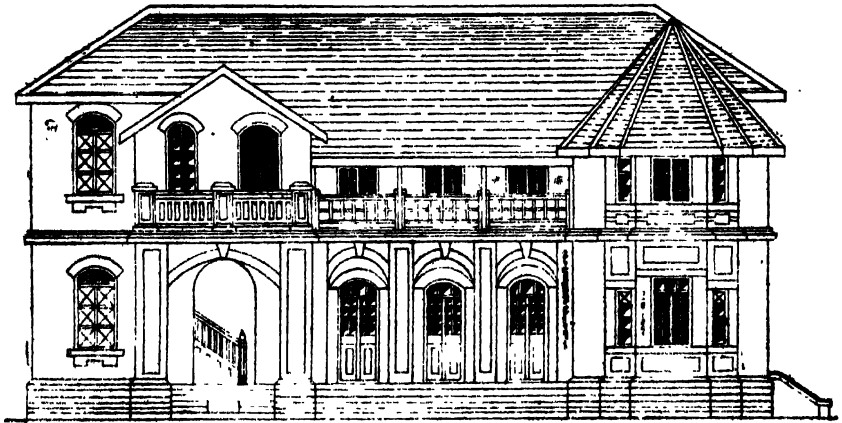


FIG. 141

the two sides of which are placed a study room and

an entrance hall. In the latter is located a staircase. Behind these, on the right hand side the guest room with a bath room attached has got a separate entrance. The drawing and dining halls in the centre are separated by an arched opening, so that they can form one big hall on special occasions and two rooms normally as desired. The end room on the left hand side should prove an excellent 'Comfort Room' with the ante-room attached to it. The



FRONT ELEVATION.
Scale 1/16".

FIG. 242

kitchen and store rooms are placed in a detached block. Upstairs four excellent bed rooms could be made with a bath room attached to each. A permanent wall may be built on the top of the arch between the drawing and dining rooms. A partition erected in the centre will make two bath rooms out of the one ante room; these two bath rooms together with the one on the right hand rear corner and one made on the top of the store

room will make four bath rooms in all for the four bed rooms. The bed room on the top of the morning room may be entered from a passage constructed on the top of the first few steps of the staircase. There is a spiral staircase and a gallery on the rear side for the use of servants. The Floor area is 5925 sq. ft. and the cost Rs. 32,000

Floor Area 7380] PLAN No. 83 [Cost Rs. 40700

This is rather a more luxurious house. In the front a large sized porch is placed, behind it is a 3 ft.

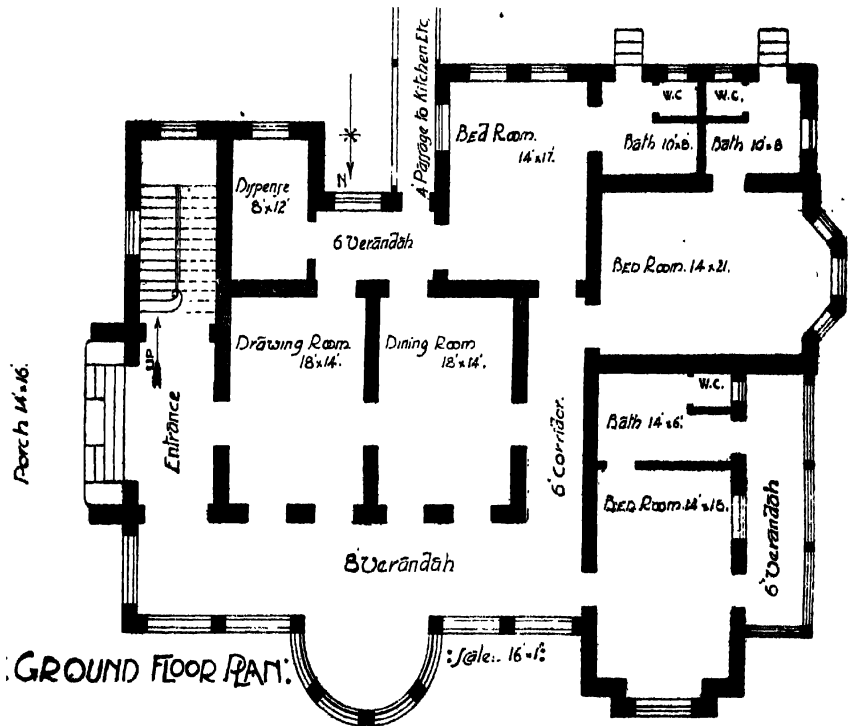


FIG. 243

verandah in which at one end a staircase is posted. The drawing and dining rooms both 18' x 14' are

centrally arranged with verandahs on both the front and rear sides. A six ft. corridor separates them from the bed rooms on the right hand side. The latter are three in number with a separate bath room and w.c. attached to each. If the latter is on a water-carriage system it is excellent. In towns, however, where water-carriage system

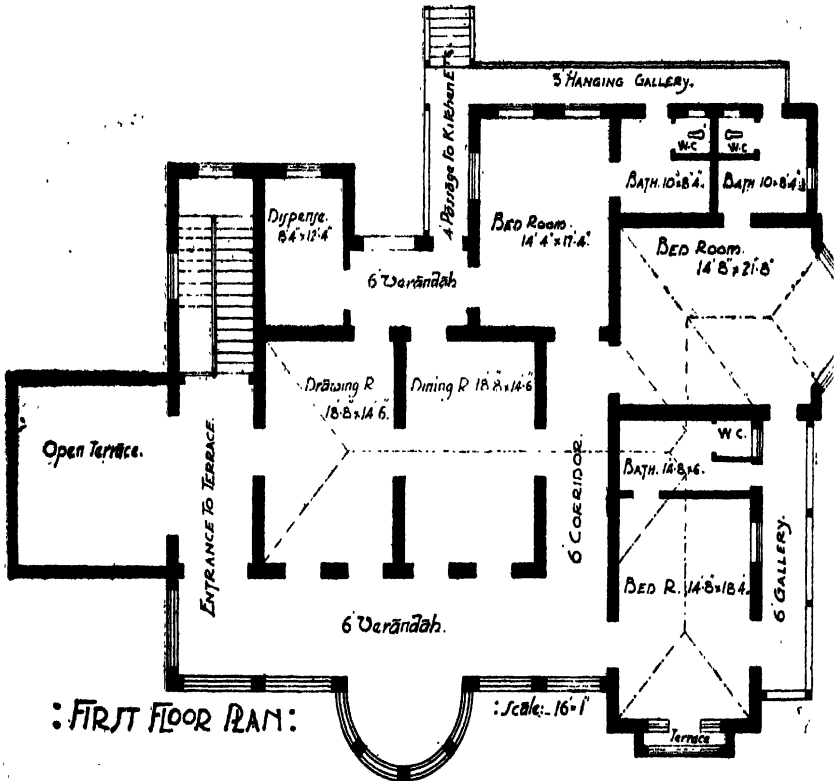


FIG. 244

does not exist, commodes may be used. For this purpose every bath room has been provided with a separate entrance for a sweeper. The block of kitchen and store room is, of course, detached from the main building. Upstairs the same arrange-

ment is shown, except that a terraced roof is constructed on the top of the porch and a 3 ft. servants' gallery with a separate staircase projected

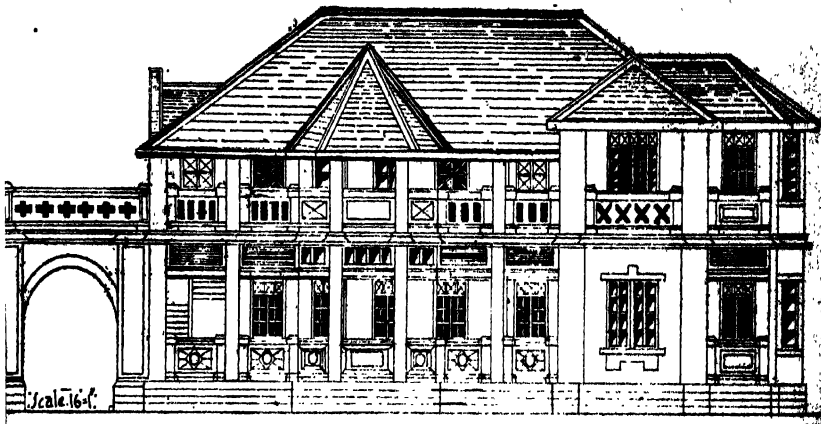
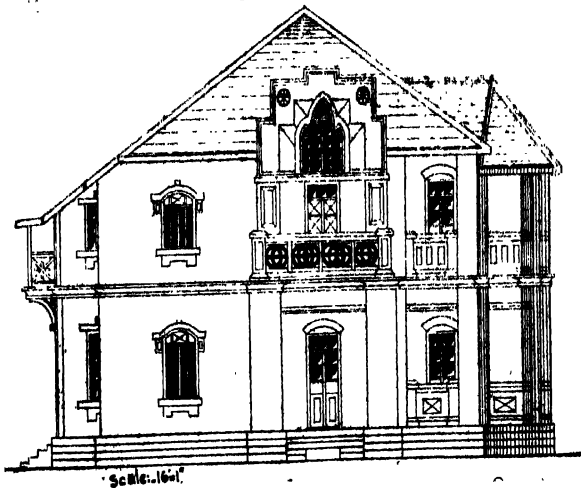


FIG. 245

on the rear side. Figs. 246 and 247 show the side



: FRONT ELEVATION

and front elevations. The Floor area of the building is 7380 sq. ft. and the cost is Rs. 40700.

Floor Area 4040] PLAN No. 84 [Cost Rs. 22500

The preceding six plans had the kitchen in a

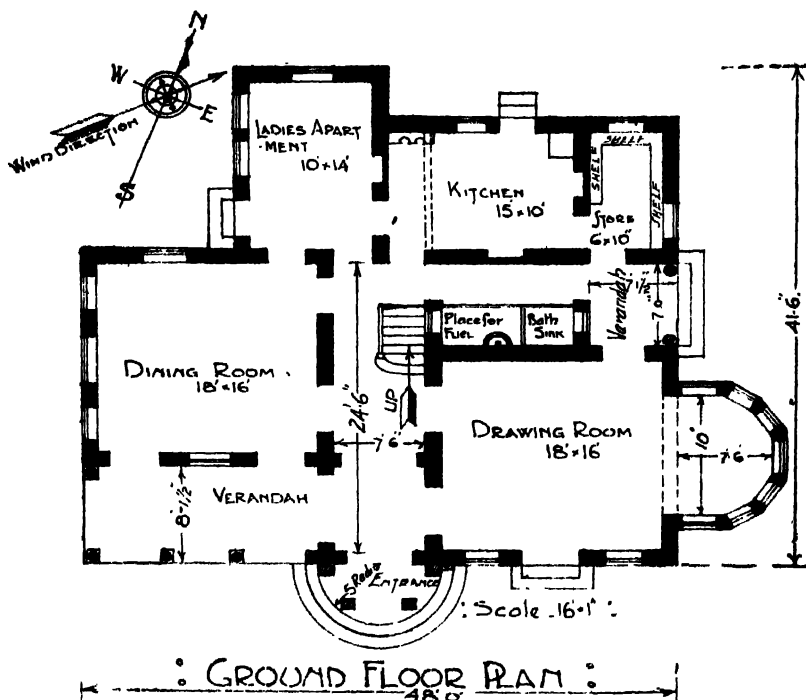


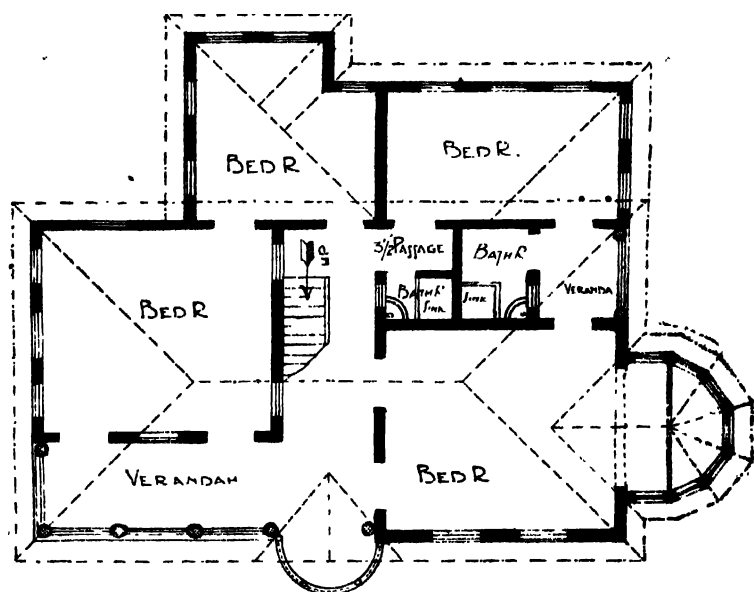
FIG. 247



: FRONT ELEVATION, :

FIG. 248

detached out-building. This and the next one provide for it in the main building itself. The plan represented by figs. 247 to 249 consists of a house with a small semi-circular entrance porch in front, behind which, is placed, a verandah on the left hand side and a passage in the front, in which a staircase is arranged. On the right hand side a spacious drawing hall of $18' \times 16'$ with a semi-circular bay projection of $10' \times 7'6"$ is located. The very good sized kitchen with a small store room attached



: FIRST FLOOR PLAN.:

FIG. 249

occupies a side in which the smoke and smells are likely to cause the least nuisance. The room adjoining the kitchen, called ladies apartment, may ordinarily prove to cause more suitable for dining purposes. Opposite the kitchen a small bath room

east and West. On the latter face a quarter-circular verandah is provided, on both sides of which, are situated, a drawing room and a ladies apartment, both with projecting bay windows. Between them is placed the staircase in three flights at right angles to each other. The kitchen,

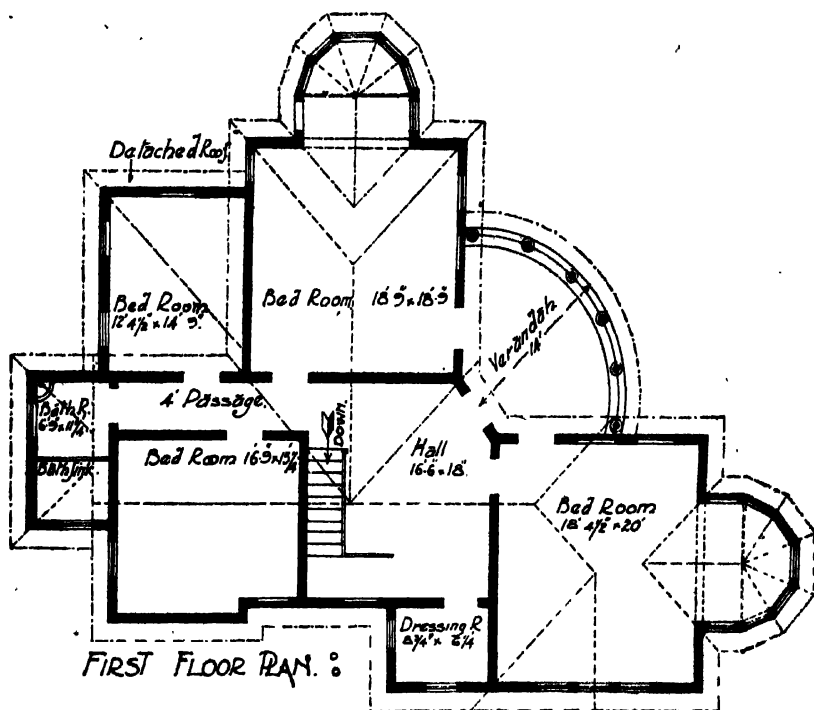


FIG. 251

and dining room, with a small store room are placed close together on the left hand side and a small bath room near the staircase. The latter can be approached independently through the verandah at entrance on the North-east face. Between the kitchen and store room a small pantry is placed in a corner. This is in a cool place and would be

very useful for storing milk and its products. The kitchen and dining room have separate exit doors.



: FRONT ELEVATION. :

FIG. 252

Upstairs 4 excellent bed rooms, a dressing and a bath room and a quarter circular verandah are



: SIDE ELEVATION. :

FIG. 253

arranged. The hall in which the staircase is placed would be a cool sitting room for common use. Thus the house is a very convenient and comfortable

one. On the North line the wind direction also is shown. The Floor area of the house is 4790 sq. ft. and the cost is about 26400 Rs. Two elevations on both faces are shown in figs. 252 and 253.

Floor Area 7080] PLAN No. 86 [Cost Rs. 38700

In this plan the staircase is placed on the right hand side with a separate entrance to it from the outside which is very convenient if the upper floor is

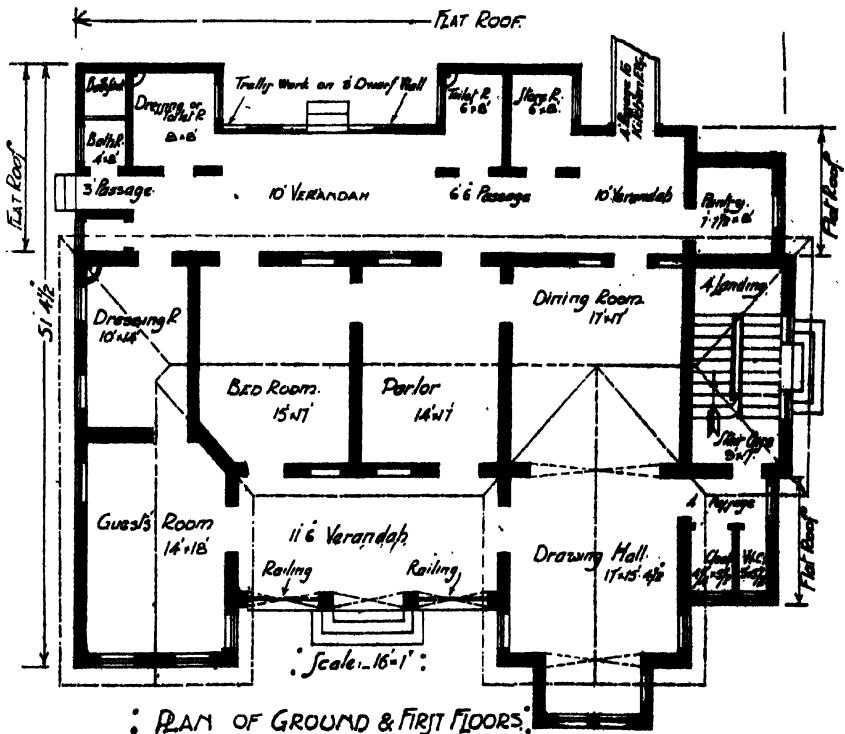


FIG. 254

to be treated as an independent flat. There is a front and rear verandah both sufficiently deep so that

the central rooms are sure to remain cool. On the right hand side of the front verandah, a dining and drawing room separated by a partition underneath an arch are provided. On the left hand a guest's room with a dressing room attached to it is placed. The two rooms in the centre will serve as two additional bed rooms. The small room behind the staircase would serve as a dispense room in which the space below the landing of the staircase can be incorporated. There is a passage throughout on the rear side for servants. The kitchen block is



FRONT ELEVATION :

FIG. 255

detached from the main building and is connected by a covered passage.

The same arrangement as on the ground floor is proposed on the first if the floors are to be used as separate flats.

The pitch given to the roof is more than usually required. The face walls of the gables are built of "Half-timber" which is very common in

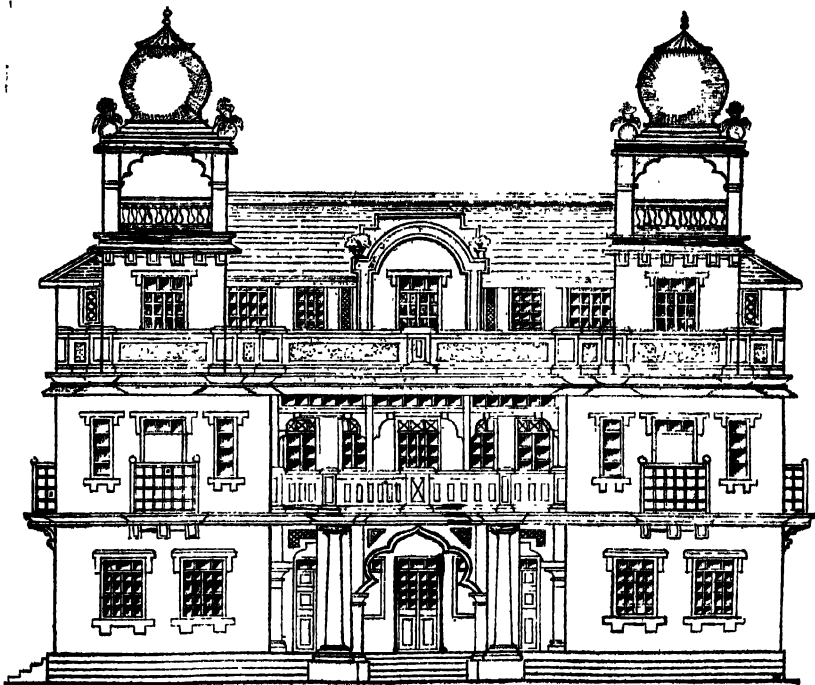
England. They consist of a timber structure of vertical posts braced together by timbers, and bricks in mortar laid between them.

The outside surface of walls is plastered in a different way. An ordinary plaster of lime mortar with some cement mixed in it is made and while wet, gravel of uniform size of half inch thickness is stuck by hand on its surface.

The Floor area of the house is 7080 sq. ft. and its cost 38700 Rs. for both floors.

Floor Area 14712] PLAN NO. 87 [Cost Rs. 85000

This is a plan of a comparatively large mansion.



Scale, 1/16" = 1'.

FRONT ELEVATION.

It is designed on the old Indian system of a central open chowk (yard) and rooms all around behind verandahs. This building, is not actually constructed,

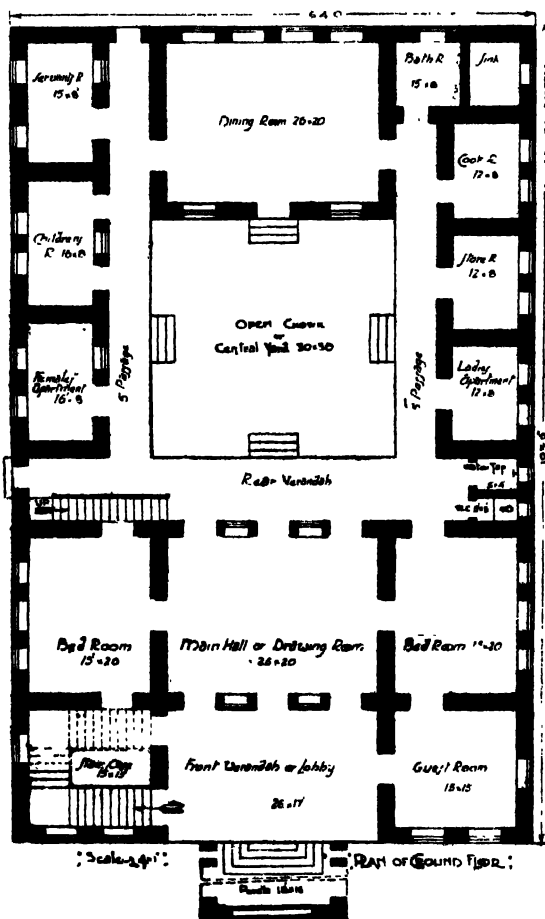


FIG. 257

but there are a number of such buildings at Baroda and Ahmedabad resembling this in plan. There is an open verandah 17 ft. wide in the front, on the left hand side of which, is placed the main staircase which is five ft. wide. There is another staircase

of less width in the rear verandah. The kitchen, storeroom and all other minor departments are arranged on the rear side and drawing hall, bed-

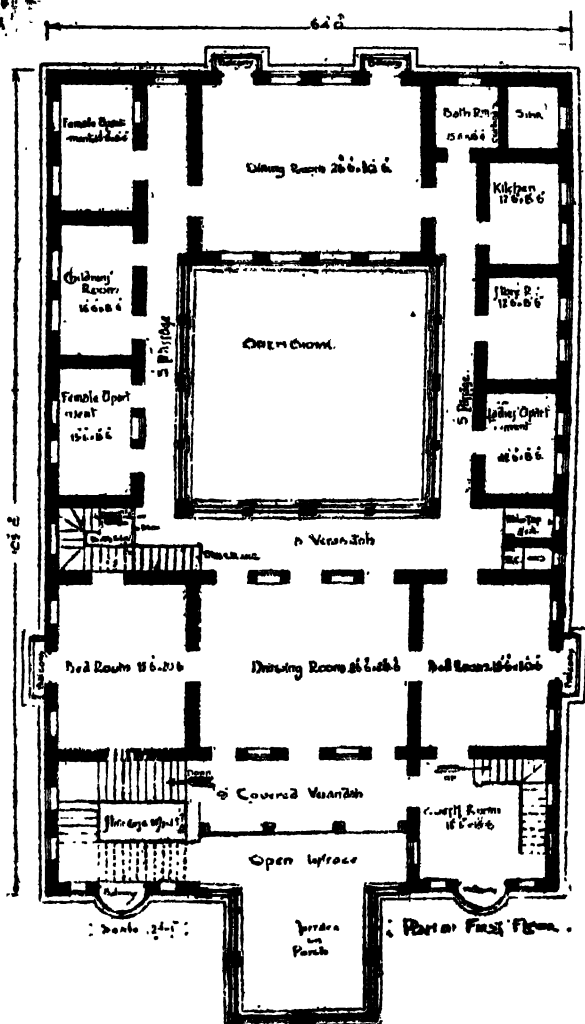


FIG. 258

rooms, guest room etc. in the front. A small terrace in the front and balconies in the sides and the

rear are provided on the first floor and a terraced roof on the top of the entire built-up area on the rear on the 2nd floor. The space occupied

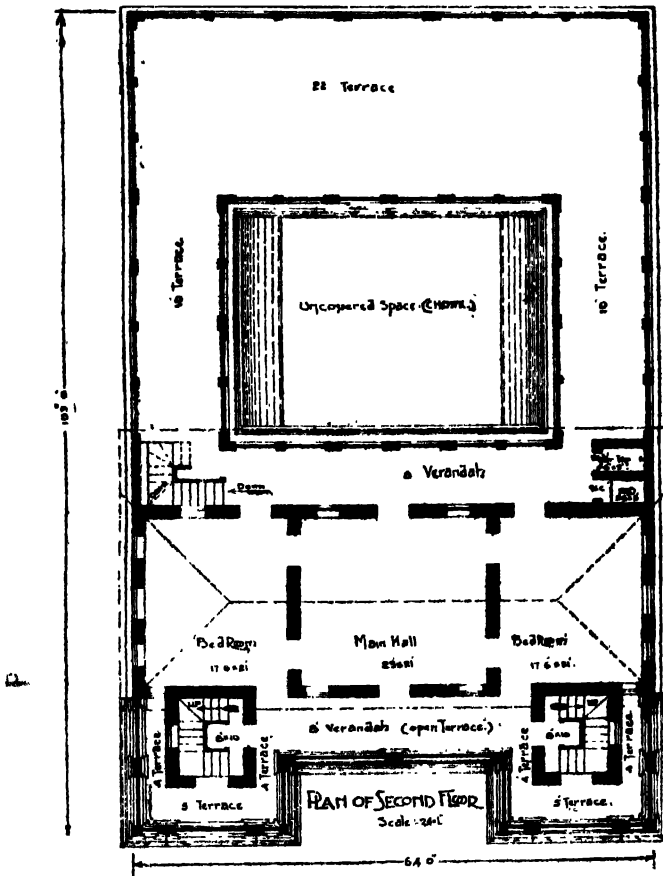
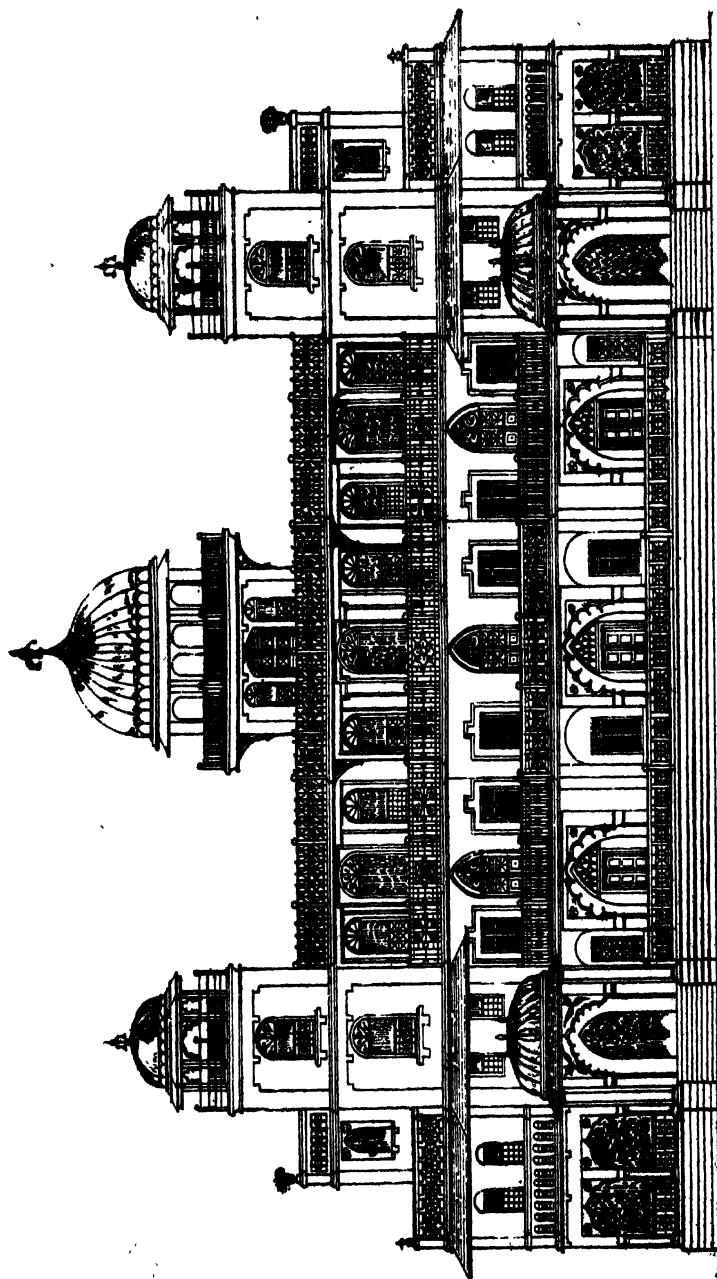


FIG. 259

by the building is $103' \times 64'$ with a central open yard of $30' \times 30'$. The total Floor area of all the four floors is 14712 sq. ft. and the cost is roughly Rs. 85000.

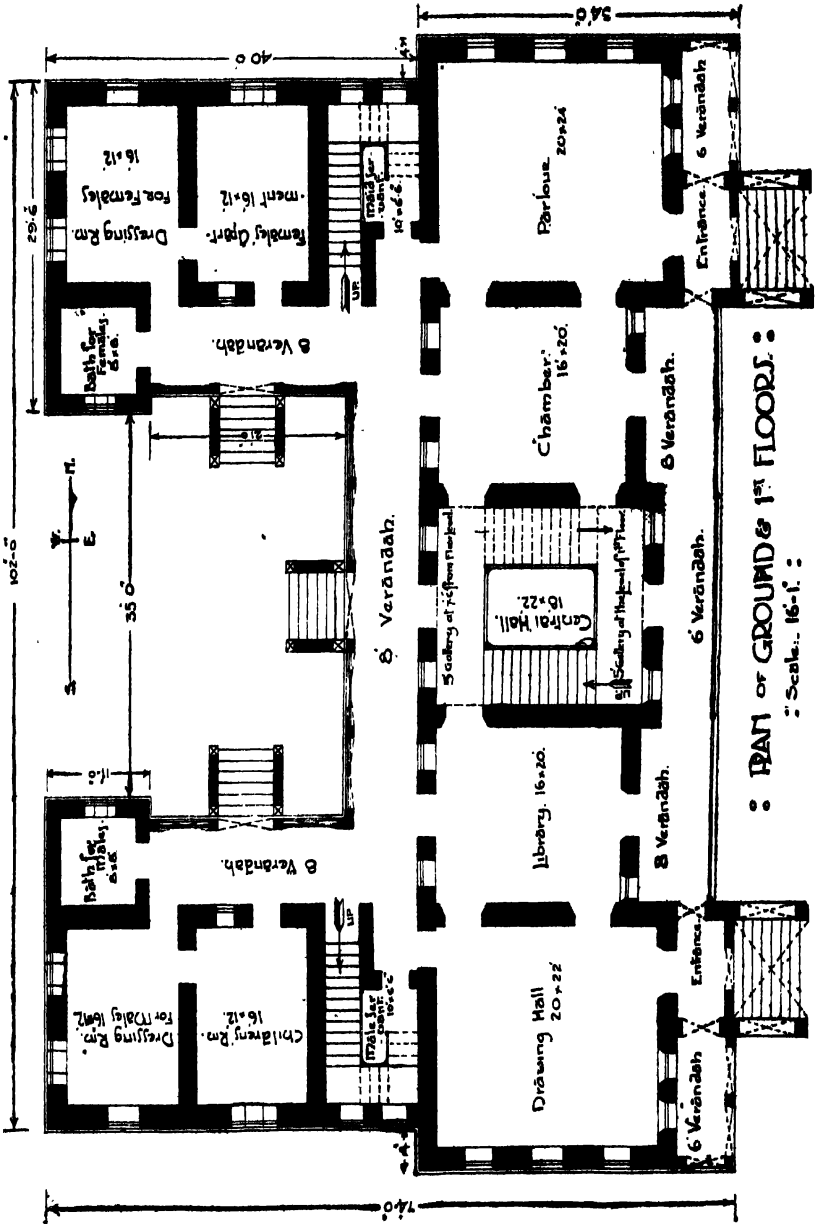
Floor Area 18520] PLAN No. 88 [Cost Rs. 120000

Really speaking palaces do not come in the purview of this little book. The apartments usually required in such buildings are numerous and varied such as a Durbar Hall, a reception Hall, a ball room, A. D. C.'s office, Private secretary's office, a library, a smoke room, a card room, bed rooms with toilet and dressing rooms attached, and so on. The grouping of these rooms also is far different from that of ordinary residential buildings. However, a ground floor plan and an elevation of a small palace are given in figs. 260 and 261. The palace is shown to face the East. A six ft. wide staircase in two flights is centrally placed with 5 ft. wide landings of full width of the room on the front and back. A library and a waiting room are arranged on both sides of the staircase room and a drawing hall and a parlour at extreme ends. There are 8 ft. verandahs on the front and rear. A children's room and a female apartment are arranged in the two wings on the back side with separate dressing and bath rooms attached to each. Domes are constructed on the top of entrance porches. The height of floors is 16 ft. The total Floor area is 18520 sq. ft. and the cost is about Rs. 1,20,000.



3 FRONT ELEVATION. :

FIG. 260



: PART OF GROUND & 1ST FLOOR. :

Scale: 1/4" = 1'-0"

FIG. 261

APPENDIX I.

Extracts from the City of Bombay Municipal Act of 1888 as amended by Act of 1905.

Building Regulations.

337. (1) Every person who shall intend to erect a building shall give to the Commissioner notice of his said intention in a form, obtained for this purpose under Section 344, specifying the position of the building intended to be erected, the description of building, the purpose for which it is intended, its dimensions, and the name of the person whom he intends to employ to supervise its erection.

345. If within thirty days after receipt of any notice the Commissioner fails to intimate in writing to the person who has given the said notice his disapproval of the building which the said person proposes to erect, or of the work which he proposes to execute; or if, within the said period, the Commissioner signifies in writing to the said person, his approval of the said building or work:

the said person may at any time within one year from the date of the delivery of the notice to the Commissioner, proceed with the said building or work in accordance with his intention as described in the notice or in any of the documents aforesaid, but not so as to contravene any of the provisions of this Act or any bye-law made under this Act at the time in force.

347A. No person shall, without the written permission of the Commissioner,

Building not to be converted to other purposes without the permission of the Commissioner.

- (a) use or permit to be used for human habitation any part of a building not originally constructed or authorised to be used for that purpose, or
- (b) converted into, or use, or permit to be used, as a chawl or building intended to form range of separate rooms for lodgers, a building not originally designed or authorised to be so used.
- (c) Every such building intended to be used as a dwelling shall be built with a plinth at least two feet above the centre of the nearest street and not below such standard level as may be fixed by the Commissioner in this behalf.
- (d) In addition to any means of ventilation required by any bye-law made under this Act at the time in force, every such building intended to be used as a dwelling shall be so constructed that the whole of at least one side of every room thereof shall either be an external wall or abut on an interior open space. Such external wall, except where it faces a street not less than 15 feet in width shall have, between it and the boundary-line of the owner's premises, an open space, extending throughout the entire length of such wall, at least two feet wide, or, in the case of a chawl or building intended to form a range of separate rooms for lodgers, at least five feet wide. Such interior open space shall have an area equal to not less than one-tenth of the aggregate floor-area of all the rooms abutting thereon and shall not be in any direction less than six feet across. And every open space whether exterior or interior, required by this clause shall be and be kept free from any erection thereon and open to the sky and shall be and be kept open to access from each end thereof,

348 (f) Every room intended to be inhabited in any such building, except a room in the roof thereof, shall be in every part at least ten feet in height from the floor to the ceiling.

(g) Every such room in the roof of any such building shall have an average height of at least eight feet from the floor to the ceiling and a minimum height of not less than four feet.

(h) Every such room shall have a clear superficial area of not less than one hundred square feet.

(i) In addition to any means of ventilation required by any bye-law made under this Act at the time in force, every such room shall be ventilated by means of doors or windows which open directly into the external air and have an aggregate opening equal to not less than *one-fourth* of the superficial area of the side of the room which faces an open space.

349A. (1) Except with the written permission of the Commissioner, no building shall be erected or raised to a greater height than *seventy feet as measured from the level of the centre of the street in front ;*

Maximum height of buildings.

(a) in the case of a pitched roof, up to the tie-beam of the roof, and

(b) in the case of a flat roof, up to the surface of the roof.

(2) In the case of pitched roof, the roof above that height shall rise at an angle of not more than forty-five degrees.

(3) In the case of a flat roof, a parapet of not more than three feet in height may be constructed above the maximum height specified in sub-section (1).

349B. Subject to the maximum prescribed by Section 349 A, the height to which a building may be erected or raised shall be regulated by the width of the street on which it abuts in accordance with the following rules, namely :—

(1) if the width of the street does not exceed twenty-six feet, the building shall not be erected or raised to a height greater than one and one-half times the width of the street ;

(2) if the width of the street exceeds twenty-six feet but does not exceed forty feet, the building shall not be erected or raised to a height greater than forty feet ; and

(3) if the width of the street exceeds forty feet, the building shall not be erected or raised to a height greater than the width of such street ;

(4) where the building abuts upon more than one street, its height shall be regulated by the wider of such streets so far as it abuts upon such wider street and also to a distance of eighty feet from such wider street, so far as it abuts upon the narrower of such streets :

* In this respect rule 2 contained in Schedule XVII to the Calcutta Municipal Act of 1899 seems to be better. It is as follows :—

2 (1) If a building is situated at the side of a street, no portion of the building shall intersect any of a series of imaginary plane drawn across the street at an angle of 45 degrees with the plane of the ground, such lines being drawn from the street alignment on the side of the street which is the more remote from the building in question, at the level of pavement or of the centre of the street.

Explanation :—If a building be placed at the edge of the street, its height must not exceed the width of the street; but if the building or one or more of its storeys be set back, the height of the building may be increased, subject to the condition that no portion of the building after the height is increased intersects any of the afore-said lines.

353A. (1) Every person within one month after the completion of the erection of such building or the execution of such work, deliver or send or cause to be delivered or send to the Commissioner at his Office, notice in writing of such completion, and shall give to the Commissioner all necessary facilities for the inspection of such building, provided that—

Completion certificates; permission to occupy or use.

- (a) such inspection shall be commenced within seven days from the date of receipt of the notice of completion, and
- (b) the Commissioner may, within seven days from the date of commencement of such inspection, by written intimation addressed to the person from whom the notice of completion was received, and delivered at his address as stated in such notice, or, in the absence of such address, affixed to a conspicuous part of the building to which such notice relates;
 - (i) give permission for the occupation of such building or for the use of the building or part thereof affected by such work, or
 - (ii) refuse such permission in case such building has been erected or such work executed so as to contravene any provision of this Act or the bye-laws.

(2) No person shall occupy or permit to be occupied any such building or use or permit to be used the building or part thereof affected by any such work until—

- (a) the permission referred to in proviso (b) to subsection (1) has been received or
- (b) the Commissioner has failed for twenty-one days after receipt of the notice of completion to intimate as aforesaid his refusal of the said permission.

Water-Closets, Privies, Urinals, &c.

250. (1) The owner or occupier of any premises on which there is a privy shall—
 Provisions as to privies.

- (a) have, between such privy and any building or place used or intended to be used for human habitation, or in which any person may be, or may be intended to be, employed in any manufacture, trade or business, an air-space of at least three feet in width and open to the sky ;
- (b) have such privy shut off by a sufficient room and wall or fence, from the view of persons dwelling in the neighbourhood or passing by ;

251. The owner or occupier of any premises on which there is a water-closet shall—
 Provisions as to water-closets.

- (a) have such water-closet divided off from any part of a building or place used or intended to be used for human habitation, or in which any person may be, or may be intended to be, employed in any manufacture, trade or business, by such means as the Commissioner shall deem sufficient ;
- (b) have such water-closet in such a position that *one of its sides at least shall be an external wall ;*
- (c) have the seat of such water-closet placed against an external wall ;
- (d) cause such water-closet to be provided with such means of constant ventilation as the Commissioner shall deem adequate, by a window or other aperture in one of the walls of such water-closet opening directly into the external air or by an air shaft or by some other suitable method or appliance ;

- (e) have such water-closet supplied by a supply cistern and flushing apparatus and fitted with a soil-pan or receiver and such other appliances of such materials, size and description as the Commissioner shall deem necessary: provided always that a cistern from which a water-closet is supplied shall not be used or be connected with another cistern which is issued for supplying water for any other purpose.

251A. No person shall build a privy or water-closet in such position or manner as—
 Position of privies and water closets.

- (a) to be directly over or directly under any room or part of a building other than another privy or water-closet or a bathing place, bath-room or terrace;
- (b) to be within a distance of twenty feet from any well or from any spring, tank or stream, the water whereof is, or is likely to be used (whether in a natural or manufactured state), for human consumption or domestic purposes, or otherwise render the water of any well, spring, tank or stream liable to pollution.

251B. No person shall use or permit to be used as a bathing place, or as a place for washing clothes or domestic utensils, any part of
 Use of places for bathing or washing clothes or domestic utensils. *any premises which has not been provided with all such appliances and fittings as shall, in the opinion of the Commissioner, be necessary for collecting the drainage thereof and conveying the same therefrom.

461A. Every person who shall construct a water-closet for use in connection with a dwelling-house shall comply with the following regulations :—
 Water-closet.

- (a) He shall cause such water-closet to be separated from any room intended to be used for human habitation by a dead wall which shall be lined internally to a height of six feet with a smooth, impervious, non-absorbent coating of neat Portland cement not less than half an inch in thickness or of glass, glazed tiles or polished marble ;
- (b) He shall make in one at least of the walls of such water-closet a window of not less than 3 square feet superficial area opening upon an external open space ;
- (c) He shall cause the entrance to such water-closet to be through a lobby or bath-room, having at least one window, or through a gallery which is entirely open to the outer air on one side ;
- (d) He shall not construct any portion of such water-closet so as to be within a distance of 3 feet from the boundary of the owners's premises, provided that this rule shall not operate to prevent a water-closet being constructed to abut on a street or service passage or open space intended to be permanently reserved as such.

Every person who shall construct a privy (including in this expression a privy on the intermediate system) shall comply with the following regulations :—

Privies.

- (a) He shall provide on each side of such privy, except the entrance side, an open space at least 3 feet in width within the limits of the owner's premises and open to the sky ;
- (b) He shall cause any entrance gallery or communicating bridge to be at least 3 feet in width and open

to the external air on both its sides and to be shut off from any portion of any dwelling-house by a closely fitting door ;

- (c) He shall make in one at least of the walls of such privy a window of not less than 3 square feet superficial area opening upon an external open space ;
- (d) He shall cause the walls of such privy to be lined internally with a smooth impervious non-absorbent coating of neat Portland cement not less than half an inch in thickness or of glass, glazed tiles or polished marble to a height of not less than five feet above the floor of such privy.

461C. No person shall construct any building or part of a building intended to be used for human habitation with its lowest flat or floor—

Level of plinth.

- (a) less than two feet above the level of the centre of the adjacent portion of the nearest street or, at the discretion of the Commissioner, less than two feet above every portion of the ground within five feet of such building, or
- (b) below such standard level as may from time to time be fixed by the Commissioner.

Every person who shall undertake construction work on a domestic masonry-walled buildings, shall construct every external wall, every wall abutting on an interior open space, and every party-wall included in such work in accordance with the following rules, and in every case the thickness prescribed shall be the minimum thickness of which any such wall may be constructed and the several rules shall apply to masonry-walls built of bricks, or hollow concrete blocks:—

Thickness for walls of domestic masonry-walled buildings.

*Minimum thickness of walls of burnt brick
in lime for domestic buildings.*

Height	Length of walls between partitions.	Thickness.
(a) Up to 10 ft	Whatever its length	9 inches
(b) 10 to 15 ft		14 inches for a height of 8', 9 inches for the remaining height.
(c) 15 to 25 ft	Up to 30 ft above 30 ft	14 inches for the whole height. 18½ inches below the topmost storey, if of more than one storey. If of ground floor or first storey only, 18½ inches for a height of 15 ft. above its base, and in either case 14 inches thick for the rest of its height.
(d) 25 to 30 ft	Up to 35 ft length above 35 ft length	18½ inches below the uppermost two storeys if it comprises more than two storeys. If less than two storeys, 18½ inches below topmost storey, and in either case 14 inches for the rest of its height. 18½ inches below the topmost storey and 14 inches for the rest of height.
(e) 30 to 40 ft	Up to 35 ft above 35 ft	18½ inches below the uppermost two storeys and 14 inches for the rest of height. 23½ inches for the height of lowest storey, 18½ inches for the rest of height below the topmost storey, and 14 inches for the remaining height.
(f) 40 to 50 ft	Up to 35 ft length above 35 ft length	18½ inches below the topmost storey, 14 inches for the rest of the height. 24 inches for the height of one storey, 18½ inches for the rest of the height below topmost storey and 14 inches for the rest of the height.
(g) 50 to 60 ft	Up to 40 ft length above 40 ft length	23½ inches for the height of one storey, 18½ inches for the rest height. 23½ inches for height of two storeys, 18½ inches for the rest height except the top storey and 14 inches for the top storey.
(h) 60 to 70 ft	Up to 40 ft length above 40 ft length	23½ inches for two storeys, 18½ inches for the remaining height except top storey, 14 inches for the top storey. 28½ inches for the first storey 23½ inches for the next two storeys 18½ inches for rest of the height except the top storey, 14 inches for the top storey.

Every person who shall undertake construction work on a building shall employ or erect therein posts of the minimum dimensions given below.

Dimensions for posts in building.

No. of Storeys.	Height of posts	Dimensions.	
		If square	if round.
Ground Floor	not exceeding 11 ft	10" × 10"	or 12" diam.
1st Floor	do 11 ft.	9" × 9"	or 10 $\frac{3}{4}$ " „
2nd „	do 11 ft.	8" × 8"	or 9 $\frac{1}{2}$ " „
3rd „	do 11 ft.	7" × 7"	or 8 $\frac{1}{4}$ " „
4th „	do 11 ft.	6" × 6"	or 7" „
5th „	do 11 ft.	5" × 5"	or 6" „

When the building is a ground-floor structure only the dimensions given for the 5th floor above are to be adopted; if of a ground and first floor, the dimensions given for the 4th floor in the above table are to be adopted for the ground floor and those for the 5th floor, for the first and so on.

(a) **Table of dimensions of beams** in inches of seasoned Teak, Benteak, Aien, Kyle etc. in domestic buildings for a distributed load of $1\frac{1}{4}$ cwt or 140 lbs per sq. ft.

Span in ft.	Distributed load of and on floor of $1\frac{1}{4}$ cwt per sq. ft. Distance from centre to centre of beams in ft.											
	Up to 5 ft.		5 to 6 ft.		6 to 7 ft.		7 to 8 ft.		8 to 9 ft.		9 to 10 ft.	
	B	D	B	D	B	D	B	D	B	D	B	D
Up to 10 ft.	5	9	6	9	6	$9\frac{1}{2}$	6	10	7	10	7	10
10 to 12 ft.	6	9	7	10	7	$10\frac{1}{2}$	$7\frac{1}{2}$	11	7	12	8	12
12 to 14 ft.	7	$10\frac{1}{2}$	7	11	$7\frac{1}{2}$	12	8	12	8	13	8	14
14 to 16 ft.	8	11	8	12	8	13	8	14	9	14	9	15
16 to 18 ft.	$8\frac{1}{2}$	12	9	13	9	14	9	15	9	16	10	16
18 to 20 ft.	9	13	9	14	10	15	10	16	10	17	10	$17\frac{1}{2}$

(b) **Table of dimensions of joists** of seasoned Teak, Benteak, Sal etc. placed 12 inches centre to centre.

Span in ft.	Distributed load of and on the floor, of $1\frac{1}{4}$ cwt per sq ft Scantlings in inches.					
	B	D	B	D	B	D
Up to 6 ft.	2	$3\frac{3}{4}$	$2\frac{1}{2}$	$3\frac{1}{2}$	3	3
6 to 8 ft.	2	5	$2\frac{1}{2}$	$4\frac{1}{2}$	3	4
8 to 10 ft.	2	$6\frac{1}{4}$	$2\frac{1}{2}$	$5\frac{1}{2}$	3	5
10 to 12 ft.	2	$7\frac{1}{2}$	$2\frac{1}{2}$	$6\frac{3}{4}$	3	$6\frac{1}{4}$
12 to 14 ft.	2	$8\frac{1}{4}$	$2\frac{1}{2}$	8	3	$7\frac{1}{4}$
14 to 16 ft.	...	...	$2\frac{1}{2}$	9	3	$8\frac{1}{4}$
16 to 18 ft.	...	...	...	...	3	$9\frac{1}{4}$
18 to 20 ft.	...	...	...	...	3	$10\frac{1}{4}$

(c) Table of dimensions of scantlings required in wooden trusses.

Span in ft.	Scantlings of timber trusses 10 ft. apart for double tiled roof.									
	Tie beam		Principals		King posts		Struts		Straining beams.	
	D	B	D	B	D	B	D	B	D	B
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
12 ft.	5	3	5	3	3	3	2½	3	...	...
14 ft.	5	3	5½	3	3	3	2½	3	.	...
16 ft.	5	3	6	3	3½	3	2½	3	...	...
18 ft.	5½	3½	6	3½	3	3½	2½	3½	...	...
20 ft.	6	3½	7	3½	3½	3½	3	3½	...	...
22 ft.	6½	3½	7½	3½	4	3½	3	3½	...	...
24 ft.	6½	4	7½	4	4	4	3	4	...	...
26 ft.	7	4	8	4	4	4	3½	4	...	...
28 ft.	7	4½	8	4½	4	4½	3½	4½	...	...
30 ft.	7½	4½	8½	4½	4	4½	3½	4½	...	...
Queen Post Truss										
26 ft.	7	4	8	4	2½	4	2½	4	5	4
28 ft.	7	4½	8	4½	2½	4½	2½	4½	5	4½
30 ft.	7½	4½	8½	4½	2½	4½	2½	4	5½	4½
32 ft.	7½	4½	9	4½	2½	4½	2½	4	6	4½
34 ft.	8	5	9½	5½	2½	4½	2½	4	6	4½
36 ft.	8	5	9½	5	2½	5	3	5	6	5
38 ft.	8	5	9½	5	2½	5	3	5	6½	5
40 ft.	8½	5	10	5	2½	5	3	5	6½	5

(d) Table of dimensions for purlins of scantlings of seasoned teak, benteak, sal etc.

Trusses ft. apart	PURLINS													
	Scantlings in inches													
	3 ft. apart		4 ft. apart		5 ft. apart		6 ft. apart		7 ft. apart		8 ft. apart		9 ft. apart	
	B	D	B	D	B	D	B	D	B	D	B	D	B	D
6	2	4	2	5	2½	5	2½	5	3	5	2½	6	3	6
7	2	4½	2½	5	3	5	2½	6	3	6	3	6½	3	7
8	2½	5	3	5	3	6	3	6½	3	7	3½	7	4	7
9	3	5	3	6	3	6½	3	7	3½	7	4	7	4	7½
10	3	5½	3½	6	4	6	4	7	4	7½	4	8	4½	8
11	3	6	3½	6½	4	7	4	7½	4	8	4½	8	5	8
12	3½	6	4	7	4	7½	4	8	5	8	5	8½	5	9
14	3½	7	4	7	4	8	5	8	5	8½	5	9	6	9

(e) Table of dimensions of rafters designed to carry a load of 56 lbs per. sq. ft. inclusive of wind pressure of 30 lbs. per sq. ft. normal to the slope of the roof.

Length of bearing in ft.	Scantlings in inches					
	12 inches apart		15 inches apart		18 inches apart	
	B	D	B	D	B	D
Up to 6	2	3	2½	3	2½	3
6 to 7	2	3	2½	3	2½	3
7 to 8	2	3½	2½	3½	2½	3½
8 to 9	2	4	2½	4	2½	4
9 to 10	2	4½	2½	4½	2½	4½
10 to 11	2	5	2½	5	2½	5
11 to 12	2	5	2½	5	2½	5

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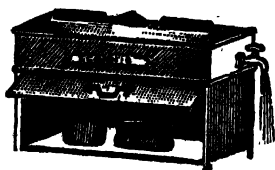
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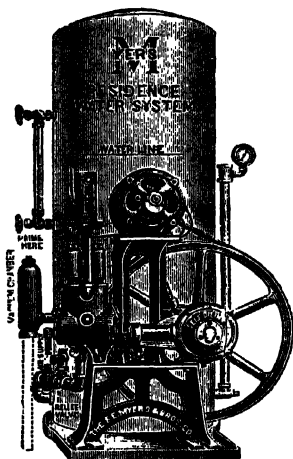
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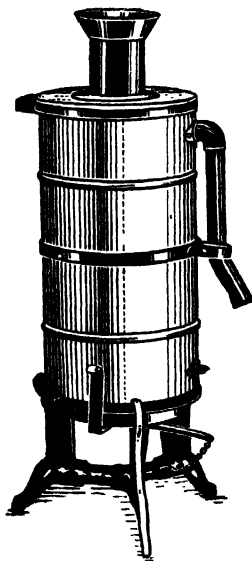
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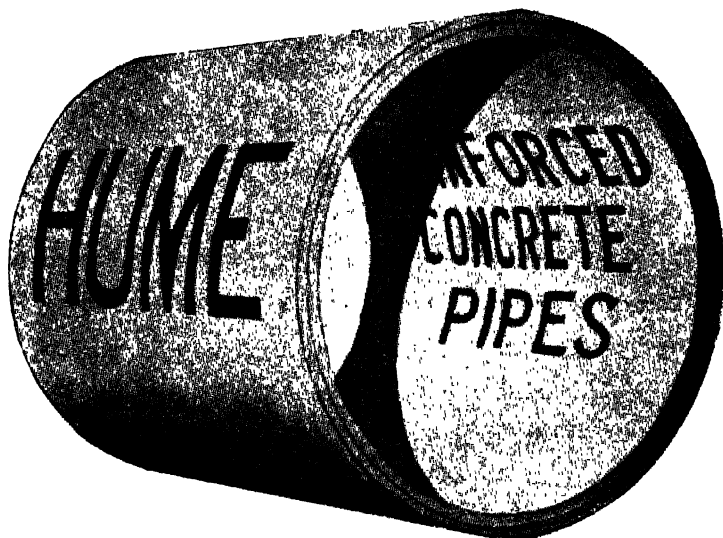
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